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## Abstract

This document describes the Print Subsystem component of OS/2 Version 2.0. It forms Volume 5 of a five-volume set; the other volumes are:

- *OS/2 Version 2.0 - Volume 1: Control Program*, GG24-3730
- *OS/2 Version 2.0 - Volume 2: DOS and Windows Environment*, GG24-3731
- *OS/2 Version 2.0 - Volume 3: Presentation Manager and Workplace Shell*, GG24-3732
- *OS/2 Version 2.0 - Volume 4: Application Development*, GG24-3774

The entire set may be ordered as *OS/2 Version 2.0 Technical Compendium*, GBOF-2254.

This document is intended for IBM system engineers, IBM authorized dealers, IBM customers, and others who require a knowledge of Presentation Manager features, functions, and implementation under OS/2 Version 2.0.

This document assumes that the reader is generally familiar with the function provided in previous releases of OS/2.

PS

(222 pages)



The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The document also outlines the responsibilities of the accounting department in ensuring that all transactions are properly recorded and reported.

The second part of the document provides a detailed description of the accounting system used by the organization. It includes information about the software used, the data sources, and the reporting requirements. This section is intended to provide a clear understanding of the system and to ensure that all users are familiar with its operation.

The third part of the document discusses the internal controls that are in place to ensure the accuracy and reliability of the financial data. It describes the various checks and balances that are implemented to prevent errors and to detect any potential fraud. The document also outlines the procedures for investigating and resolving any issues that may arise.

The fourth part of the document provides a summary of the key findings and recommendations. It highlights the areas where improvements are needed and provides suggestions for how these can be implemented. The document also includes a list of the key personnel responsible for implementing the recommendations.

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## Special Notices

This publication is intended to help customers and system engineers to understand and utilize the new features in Version 2.0 of OS/2. The information in this publication is not intended as the specification of any programming interfaces that are provided by the Programming Tools and Information package. See the PUBLICATIONS of the IBM Programming Announcement for OS/2 Version 2.0 for more information about what publications are considered to be product documentation.

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Systems Application Architecture  
WIN-OS/2  
Workplace Shell

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## Preface

This document is intended to provide readers with an understanding of the functions provided by the OS/2 Version 2.0 Print Subsystem. The document should enable readers to make an evaluation of the OS/2 Version 2.0 product and its components.

The document contains information on the implementation of the OS/2 V2.0 Print Subsystem whose Workplace Shell components conform to the 1991 IBM Systems Application Architecture (SAA) Common User Access (CUA) Workplace Environment. It also contains information on a variety of enhancements including the addition of the WIN-OS/2 interface and its print related components.

This document is intended for users, planners and technical support personnel who require an understanding of the function provided by the Print Subsystem in OS/2 Version 2.0, and the implementation of that function.

The document is organized into three sections as follows:

- Chapters 2-6 cover the installation, configuration and management of the OS/2 V2.0 Print Subsystem. They primarily focus on the Workplace Shell interface, the WIN-OS/2 interface, and the coordination between those two interfaces. These chapters are recommended for all readers.
- Chapters 7-11 cover, with more detail, the components of the OS/2 V2.0 Print Subsystem. They primarily focus on how these components relate to each other and how they relate to the other components of OS/2 V2.0. These chapters are recommended for all planners and technical support personnel of the OS/2 V2.0 Print Subsystem.
- The Appendices cover specific topics in detail that do not fit in the general flow of the preceding chapters. They will be of interest to those who require details of the specific topics they cover.

A brief overview of each chapter may be found in Chapter 1.

### Editor's Note

With the release of OS/2 V2.0, print subsystem function and flexibility have been vastly increased. In our testing two things became apparent:

- This volume would never be published if we tried to test everything that is possible with the OS/2 V2.0 print subsystem.
- In the scenarios we encountered it became apparent that the way to approach a print situation using OS/2 V2.0 print subsystem was not to ask *can* this be done, but instead, *how* can this be done. There always seemed to be a way, and in some cases several ways, to accomplish a task.

We will continue to test and explore new scenarios but ask you for your help. Not just with regard to feedback about this volume, but also with any scenarios, utilities or programs you encounter that complement or enhance the ability to print under the OS/2 V2.0 print subsystem.



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## Related Publications

The following publications are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- *OS/2 V1.3 Volume 2: Print Subsystem*, GG24-3631
- *OS/2 Version 2.0 - Volume 1: Control Program*, GG24-3730
- *OS/2 Version 2.0 - Volume 2: DOS and Windows Environment*, GG24-3731
- *OS/2 Version 2.0 - Volume 3: Presentation Manager and Workplace Shell*, GG24-3732
- *OS/2 Version 2.0 - Volume 4: Application Development*, GG24-3774
- *OS/2 Version 2.0 Remote Installation and Maintenance*, GG24-3780
- *ITSC Printing Library - Printing PostScript Language*, GG24-3529
- *IBM SAA Application Connection Services 1.1.3 - Distributed Print Facility*, GG24-3766
- *OS/2 2.0 Technical Library Presentation Driver Reference*, S10G-6267





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**OS/2 Version 2.0****Volume 5: Print Subsystem****Publication No. GG24-3775-00**

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## Chapter 1. Overview

This book is presented in two logical sections. The first part discusses how the OS/2<sup>®</sup> V2.0 print subsystem is represented on your screen and what options it offers to you. It then goes on to describe the procedures for selecting these options. The second part presents overviews of the system architecture, introduces the working components of the subsystem, describes what these components do and how they work together to produce printed output.

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### 1.1 Usage and Configuration Chapters

- *Chapter 2, "User Perspective"*

The implementation of Windows<sup>™</sup> support has produced two user interfaces within the OS/2 V2.0 print subsystem. This chapter shows you how to deal with these two interfaces. We will show you how to configure and manage OS/2 printer subsystem objects like the Printer Object, Queue Driver Object, Printer Driver Object, Port Object, Job Object and Spooler Object. We will also show you how to configure and manage WIN-OS/2 printer components like Print Manager and the Control Panel. Finally we describe what you have to do in order to configure and manage printing from the WIN-OS/2 components through the OS/2 objects including how to configure the elusive LPT3.OS2 for WIN-OS/2.

- *Chapter 3, "The LAN Environment"*

The implementation of the Workplace Shell in OS/2 V2.0 extends beyond the local desktop and into the network environment. The LAN Independent Workplace Shell provides a seamless link between the desktop and available network resources such as files and printers. Both the Workplace Shell and the LAN Independent Workplace Shell use the network printer object to configure and manage remote printers. This chapter will focus on the network printer object as well as how to access the network printers from non-PM environments such as DOS sessions, OS/2 sessions and WIN-OS/2. We will show you how to access remote printers from within your logon domain as well as across multiple domains.

- *Chapter 4, "Fonts"*

Fonts are used for output by the system to displays and printers. With the many types of displays and even more numerous types of printers one can imagine the complexity of tracking who can use which fonts and what they look like on a 96 dot per inch display as well as a 300 dot per inch printer. OS/2 Version 2.0 utilizes the Graphics Engine (GRE) for this purpose. Adobe<sup>™</sup> Type Manager<sup>™</sup> (ATM<sup>™</sup>) is the rasterizer that ships with OS/2 and, through the Intelligent Font Interface (IFI), interfaces with the GRE. There are two ATMs present in OS/2 Version 2.0, one for OS/2 PM applications and the other for WIN-OS/2 applications. These ATMs allow the system to provide a seamless look and consistent output while using *most* applications. Because there are two ATMs with some duplicate files, however, proper installation and management of fonts is critical.

- *Chapter 5, "Output Configurations"*

With the introduction of OS/2 output considerations extend well beyond one printer configured for each port. Concepts such as Pooling, Printer Object Sharing and Automatic Emulation Switching through printer drivers instead of

additional code are discussed. Techniques such as COM3-4 support for the ISA/EISA bus are explained. Discussions on physical vs. logical ports, and the parallel vs. serial interfaces complete this chapter.

- *Chapter 6, "Printing from Applications"*

The objective of this chapter is to investigate, using examples, the various possibilities and techniques of printing from applications with OS/2 Version 2.0. In order to provide appropriate scenarios in which to test this, we created an environment with numerous applications and different kinds of printers and plotters. We stay away from the usual simple approach of explaining how to print the famous CONFIG.SYS file on a printer connected to LPT1. Instead we explore some complex printing situations, similar to those users would be faced with in the "real world."

---

## 1.2 Architecture Chapters

- *Chapter 7, "Print Subsystem Design and Components"*

The print subsystem in OS/2 V2.0 consists of different components working together to serve the OS/2 environment as well as the WIN-OS/2 environment. This includes not just services on one side for the applications and on the other side for the physical port, or, the formatting of printing information for a particular printer, but also a new set of APIs called the Spl APIs. Not only is there an advanced technical print subsystem but also an advanced printer subsystem user interface imbedded in the Workplace Shell that offers you an easy "drag & drop" way of creating, using and maintaining of all your available local printer devices as well as those on a network. The technical components of the print subsystem are talked about in detail in this chapter.

- *Chapter 8, "Print Subsystem Data Flow"*

This chapter provides a highly detailed view of the entire print subsystem architecture and how the print data moves through it. The print data flow through the print subsystem can be categorized in three ways according to the route taken. They are PM Queued, PM Direct and Basic printing. Depending on the application you are printing from, your print data will take one of several different routes through the OS/2 V2.0 print subsystem. This is because different combinations of print subsystem components are required to process print data arriving from different applications. All of the possible data routes from the various supported application types through the print subsystem are shown.

- *Chapter 9, "System Files"*

This chapter talks about the system files which are relevant to the operation of the print subsystem. They are grouped into two categories, OS/2 and WIN-OS/2. Not only is the content and relation to the print subsystem discussed, but backup and restoration of these critical files is also covered.

---

## Chapter 2. User Perspective

Because of the ability to run Windows programs there are two user interfaces within the OS/2 V2.0 print subsystem. This chapter shows you how to deal with these two interfaces.

We will show you how to configure and manage OS/2 print subsystem objects like the:

- Printer Object
- Queue Driver Object
- Printer Driver Object
- Port Object
- Job Object
- Spooler Object.

We will also show you how to configure and manage WIN-OS/2 print subsystem components like the:

- Print Manager
- Control Panel
- ATM Control Panel.

Finally we describe what you have to do in order to configure and manage printing from the WIN-OS/2 components *through* the OS/2 objects.



---

## 2.1 User Interfaces for Printing

The OS/2 V2.0 print subsystem has been developed to provide printing support for DOS, OS/2 (16-bit and 32-bit) and Presentation Manager, as well as Windows. There are *two* separate user interfaces within the OS/2 V2.0 print subsystem, namely the OS/2 user interface and the WIN-OS/2 user interface.

### 2.1.1 OS/2 User Interface

Configuration and management of printing is provided for DOS, DOS applications, OS/2 applications, Presentation Manager applications, Print Screen, printing commands and drag-and-drop through a completely new user interface which is designed to support the Workplace Shell and its object-oriented environment. Management of printing from WIN-OS/2 applications can also be done through this interface.

The OS/2 user interface consists of a total of six types of objects accessible from the desktop. Each of these objects represents a functioning component of the OS/2 V2.0 print subsystem that collectively interact in various ways to produce the desired output. Use of this interface is simplified by having just one type of object visible on the desktop, through which printing configuration and management can be directed. This is called the Printer Object. This object allows you access to the other objects associated with printing such as the:

- Job Object
- Printer Driver Object
- Port Object
- Queue Driver Object.

The Spooler Object is separate and is accessed through the System Folder.

Each of these objects is discussed in the following sections in terms of what they are and what options they provide to you, together with other related aspects of printing from OS/2 V2.0. Where appropriate, tips are included and preferred procedures are recommended to you.

### 2.1.2 WIN-OS/2 Interface

WIN-OS/2 print support is provided through the WIN-OS/2 Print Manager and Control Panel. The WIN-OS/2 user interface is accessed through a WIN-OS/2 full screen or "windowed" session. By using the "windowed" or "seamless" WIN-OS/2 session(s) it is possible to display the WIN-OS/2 print subsystem components on the Workplace Shell. These components are the:

- Print Manager
- Control Panel
- ATM Control Panel.

#### Note

You can only run a "windowed" or "seamless" WIN-OS/2 session if your display resolution supports this! When you install OS/2 2.0, the installation dialog will inform you if your default resolution will only support full screen WIN-OS/2 sessions. In those resolutions you can still create the WIN-OS/2 components as icons on the Workplace Shell but when you open them you will automatically be in a full screen WIN-OS/2 session.

It should also be noted that in some resolutions, when printing from a full screen WIN-OS/2 session, printing is suspended if you switch back to the Workplace Shell while the print job is still spooling.

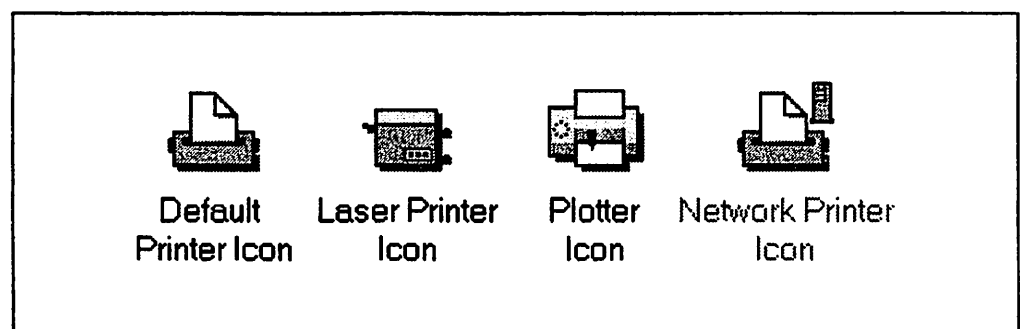
The WIN-OS/2 Print Manager and Control Panel provide the user the management and configuration options (respectively) for printing from WIN-OS/2 applications. The ATM Control Panel is used to manage fonts for WIN-OS/2 printers and displays.

## 2.2 OS/2 Printer Object

During OS/2 installation, if you installed a printer or plotter, an icon called a printer object is added to your desktop to represent the local printer or plotter. Network printer objects are initially located inside the Network folder.

Each printer object has a single print queue. Depending on the output configuration selected, a printer object can represent several physical printers and/or ports which can accept a print job queued to the printer object. However the most common configuration of a printer object is a single print queue with one assigned port and one printer driver. Users of OS/2 V1.3 will be quite familiar with this concept already and you may like to consider each printer object as a mini-Print Manager which is dedicated to a single queue. Remember, however, that the former OS/2 Print Manager no longer exists in OS/2 V2.0.

Printer objects can be created, copied, deleted, held/released, selected as default, and adjusted using many changeable settings within their menus.



*Figure 1. OS/2 V2.0 System Supplied Icons for Printer Objects*

## 2.2.1 Naming a Printer Object/Queue

The name that you type in when creating a printer object is used for more than just the icon name. The system will use this name to also create the spool queue physical name. You have no control over the spool queue name other than through your choice of icon name! The queue name is limited to eight characters so that it will support systems that use the FAT directory naming restrictions. The system will strip out any blanks in the icon name and then take the first eight characters to create the spool queue name. If the resulting name already exists the last character is replaced with a number starting with "1" then incremented until it is a unique name. Once the system has generated this name it cannot be changed other than by deleting the printer object and then creating a new one.

The queue name is the one that will appear in most applications' printer lists and therefore it is desirable to have the icon name the same as the queue name. The only way to assure this is to make the first eight characters of your new name unique and meaningful. Also, if this printer is to be shared on a network then make sure you follow the naming conventions for aliases on a network. Specifically, you could name a printer object 4029PCL5 but you could not use that name for a network alias as they cannot begin with a number or special characters. Applications are changing to support the longer and easier to use names but it will take time.

## 2.2.2 Creating a Local Printer Object

There are various ways of creating a local printer object. Three of the methods are:

1. From a template
2. From a printer driver file
3. From an existing printer object.

### 2.2.2.1 From the Templates Folder

To create a printer object from the Templates folder:

1. Double click on the **Templates** folder
2. Drag the **Printer** template to a folder or to some other available place on your desktop
3. This brings up the **Create a Printer** dialog (see Figure 2 on page 7)
4. Type a unique name into the **Name** field
5. Click on a printer driver from the **Default printer driver** container. Note: If the printer driver you want is not yet installed you can install it here as shown in Figure 15 on page 22. See 2.3.1, "Installing an OS/2 Printer Driver Object" on page 21 for instructions on how to do this
6. Click on an output port in the **Output port** container
7. Click on **Create**.

When this new printer object is created you *may* get a Printer message box asking you whether you want to install the equivalent WIN-OS/2 printer. This message will appear if the OS/2 printer driver you installed has an equivalent WIN-OS/2 printer driver that is listed in the \OS2\MDOS\WINOS2\DRVMAP.INF file and it has not been previously installed. You will need the OS/2 V2.0 printer

driver diskettes in order to do this at this point in the installation. If you click on Yes the system will prompt you for the correct diskette(s).

#### Notes

In some cases it may be easier in the long run *not* to install the WIN-OS/2 printer driver at the same time as the OS/2 printer driver. If your system is on a network it may be better to have the printer drivers for OS/2 and WIN-OS/2 loaded on a shared disk from where everyone can install them using that path. Not only is this method quicker but you are assured that all the systems have identical drivers.

Unlike the WIN-OS/2 diskette-prompted installation in OS/2, if you install your WIN-OS/2 printers using the WIN-OS/2 Control Panel then you will be able to type in a path other than the diskette drive.

*Do not blindly copy the printer drivers diskettes onto a disk.* There are duplicate file names on several disks because they contain both the OS/2 and WIN-OS/2 printer drivers. Some drivers will effectively disappear as the WIN-OS/2 driver with the same name will write over the OS/2 driver or vice versa. Follow the instructions in Chapter 3, "LAN Environment" on page 55 if you wish to install drivers this way.

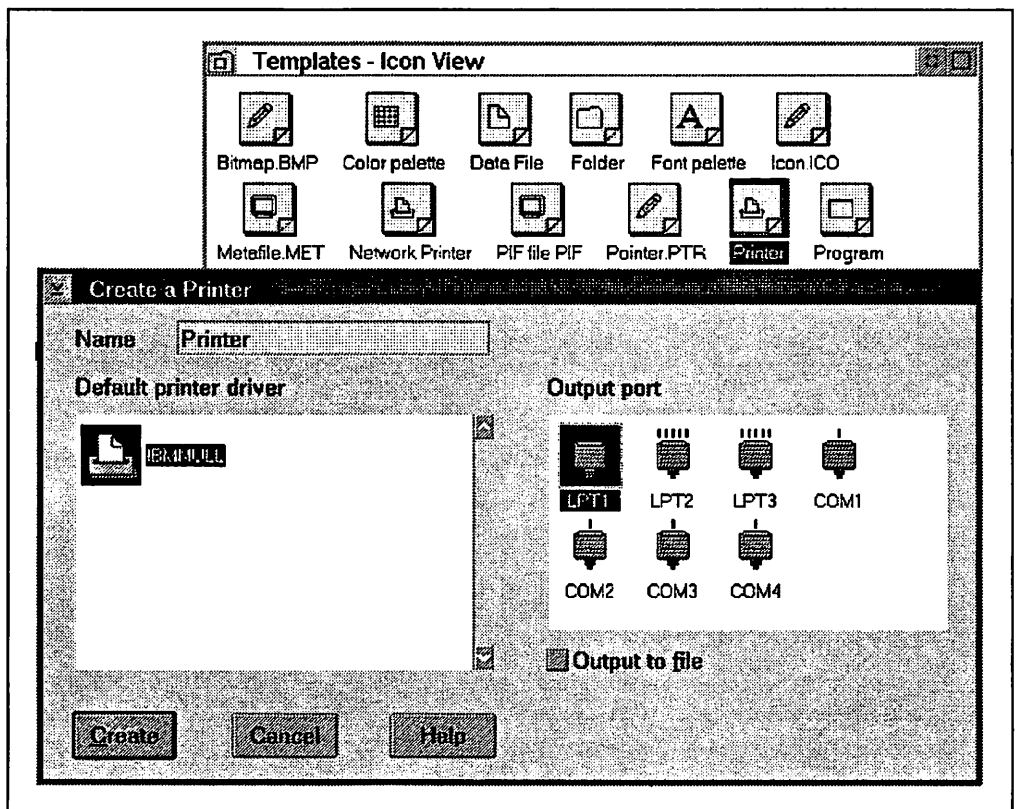


Figure 2. Creating a Printer Object from the Template Folder

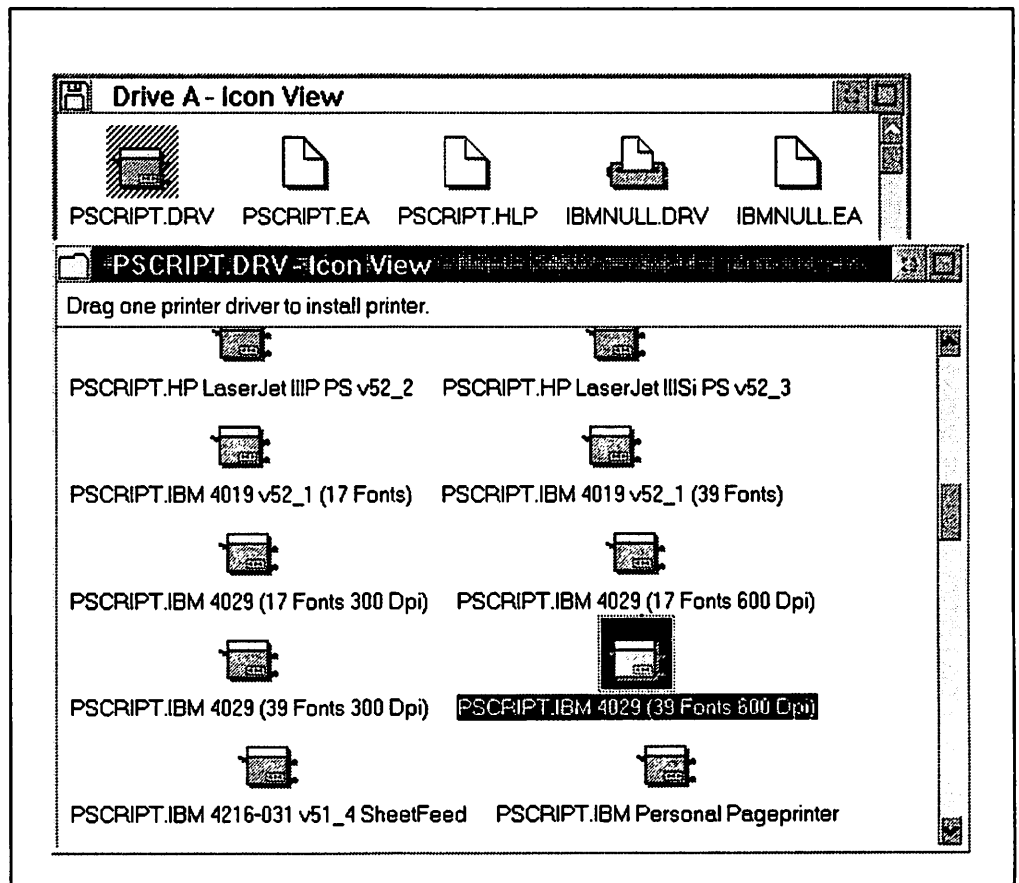
### 2.2.2.2 From a Printer Driver File

This method has the advantage of not only creating a new printer object on the desktop, but it will also automatically install the printer driver. If you are installing an OEM printer driver then simply follow the steps below. If, however, you are installing a printer driver on the OS/2 V2.0 printer driver diskettes then you need to know which of the diskettes contain the driver for the printer you wish to install. To find this out follow the instructions in 2.3.5, "Listing Printer Driver Diskette Contents" on page 26. When you know which is the proper diskette:

1. Insert the desired printer driver diskette into drive A
2. Double click on **Drive A**
3. Double click on the appropriate printer driver
4. Drag the appropriate printer driver icon from the **Drive A** window to a folder or to some other available place on your desktop.

You *may* get a Printer message box asking you whether you want to install the equivalent WIN-OS/2 printer. This message will appear if the OS/2 printer driver you installed has an equivalent WIN-OS/2 printer driver that is listed in the \OS2\MDOS\WINOS2\DRVMAP.INF file and it has not been previously installed.. You will need the OS/2 V2.0 printer driver diskettes in order to do this at this point in the installation. If you click on Yes the system will prompt you for the correct diskette(s). Refer to the notes under 2.2.2.1, "From the Templates Folder" on page 6 regarding this.

If the printer drivers have been copied to your local disk or are available on a network disk you can also use the preceding method. Just access the printer drivers through the appropriate drives and folder object.



**Figure 3. Creating a Printer Object from a Printer Driver Diskette**

### 2.2.2.3 From an Existing Printer Object

Create a printer object from an existing printer object :

1. Display the context menu for this printer object (use mouse button 2)
2. Click on **Create another**. This brings up the Create Another dialog
3. Change the name in the **New name** field. See 2.2.1, "Naming a Printer Object/Queue" on page 6
4. Click on a folder as the target to create this print object to in the **Opened** tab of the shown notebook. The default will be the folder of the original object, usually the OS/2 V2.0 Desktop
5. Click on **Create**. This will bring up the Create a Printer dialog
6. Change the name in the **Name** field as this is the name that will appear together with the icon in your system
7. Click on the appropriate **Output port** or click on the **Output to file** box or select "none" by clicking on any blank space inside of the port container window
8. Click on the appropriate **Default printer driver**. The default selection is the default printer driver of the printer object you created the new one from. Note: If the printer driver you want is not yet installed you can install it from here. See 2.3.1, "Installing an OS/2 Printer Driver Object" on page 21 for instructions on how to do this
9. Click on **Create**.

You *may* get a Printer message box asking you whether you want to install the equivalent WIN-OS/2 printer. This message will appear if the OS/2 printer driver you installed has an equivalent WIN-OS/2 printer driver that is listed in the \OS2\MDOS\WINOS2\DRVMAP.INF file and it has not been previously installed. You will need the OS/2 V2.0 printer driver diskettes in order to do this at this point in the installation. If you click on Yes the system will prompt you for the correct diskette(s). Refer to the notes under 2.2.2.1, "From the Templates Folder" on page 6 regarding this.

#### Note

You can also create new printer objects by using the copy command in the context menu of an existing printer object, or by holding the Ctrl key while dragging an existing printer object. We encountered problems such as the new object name would revert to the copied from object name regardless of what you type in. Also the new object could not be deleted by shredding, only by choosing delete from its context menu. This is a known problem and should be fixed in a future release.

### 2.2.3 Deleting a Printer Object

To delete a printer object drag the printer object to the **Shredder** or select **Delete** from the context menu for the printer object (use mouse button 2).

Note that if the printer object has print-jobs currently waiting to print then the printer status becomes "Pending Deletion." After all pending jobs are printed then the system processes your request to delete the printer object.

## 2.2.4 Configuring a Local Printer Object

These settings allow you to view or change things such as the view, printer driver, printer settings, job properties, queue options such as current queue driver, and print options such as a separator file.

To view or change the settings:

1. Display the context menu for the printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the appropriate tab for the option that you want to view or change.

Or, if the printer object is open on your desktop:

1. Click on the system icon in the upper left corner of the title bar
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the appropriate tab for the option that you want to view or change.

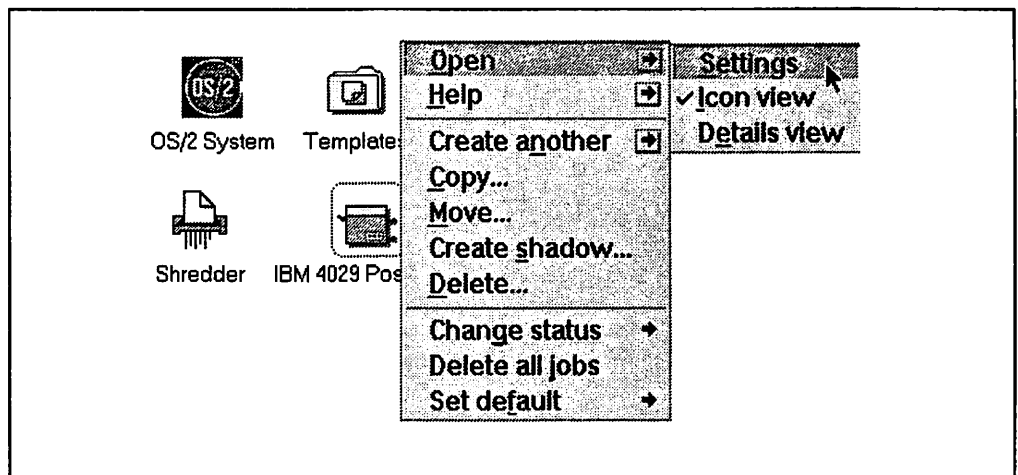


Figure 4. Accessing the Printer Object Settings from the Workplace Shell

### Note

In general, the changes to the different setting pages in the **Settings** notebook do not take effect until you close down the **Settings** dialog for the printer object. Some may take effect while the settings are still open but it is good practice to close down the settings after making any changes.



### 2.2.4.1 View

The View page shows you the system's *physical* name, which is the internal name of the object queue and the name of the queue folder in the spooler folder. This name is generated from the name you typed in at creation time and cannot be changed in these settings. It is limited to eight characters to accommodate FAT file systems. While *some* applications use this name to identify the printer, others use the **Title** name in the **General** tab, and still others use both. See 2.2.1, "Naming a Printer Object/Queue" on page 6.

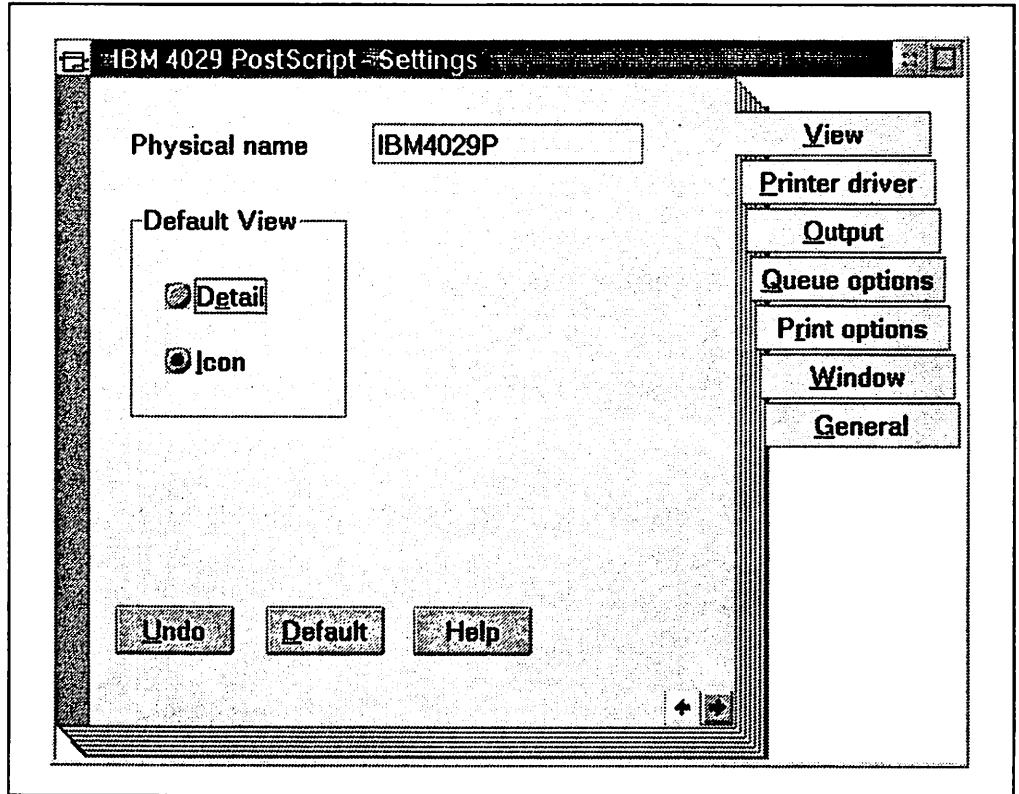


Figure 5. View Tab of the Printer Object Settings

In the **Default View** group, you can set the way your print-jobs are displayed when you double click on a printer object. They can be displayed either as icons or with more detailed textual information.

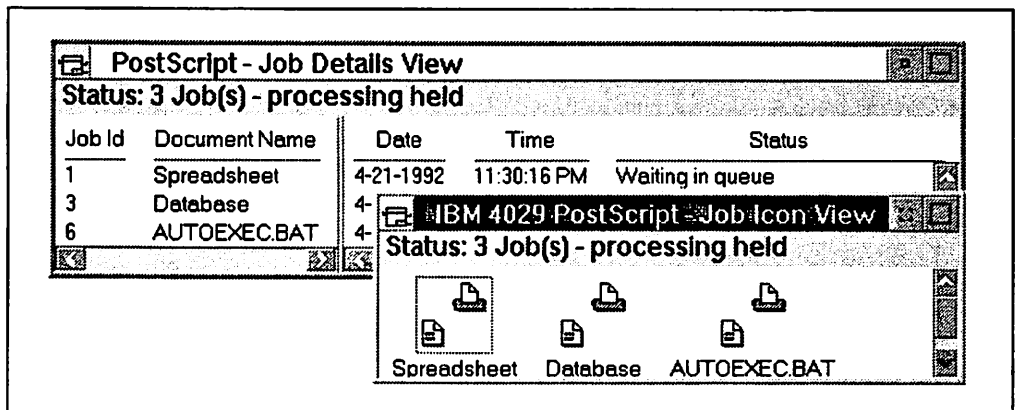


Figure 6. Icon View vs. Details View of Print Jobs

### 2.2.4.2 Printer Driver

The printer driver page shows the installed **Printer drivers** and the **Default printer driver** used by this print object. You can change your selections or make a different driver the default driver. Click on the **Job properties** pushbutton to set up default job requirements unique to this object, such as paper size or resolution. You can also install additional printer objects for the same physical printer but with different job properties. For a detailed scenario on how and why you would do this see 5.3.2, "Port with Multiple Printer Objects (Sharing)" on page 113.

You may see more than one printer driver object in the Default printer driver container although only one will be highlighted as the default for this object. Unlike Windows and WIN-OS/2, in OS/2 V2.0 you can have more than one printer object defined *and* active for the same output port. If these objects have different default printer drivers specified then *all* of the drivers will appear in the Default printer driver container in each of the printer objects assigned to that port but only one would be selected as the default for this object. For a scenario on why you would do this see 5.3.1, "Printer Object with Multiple Ports (Pooling)" on page 111. Over time, printer drivers may collect in the **Default driver** window as you reassign ports or add and delete printer objects. If you want to remove the driver(s) that are no longer assigned to the port of the printer object, simply click on the desired default driver in the **Printer driver** container and close the settings.

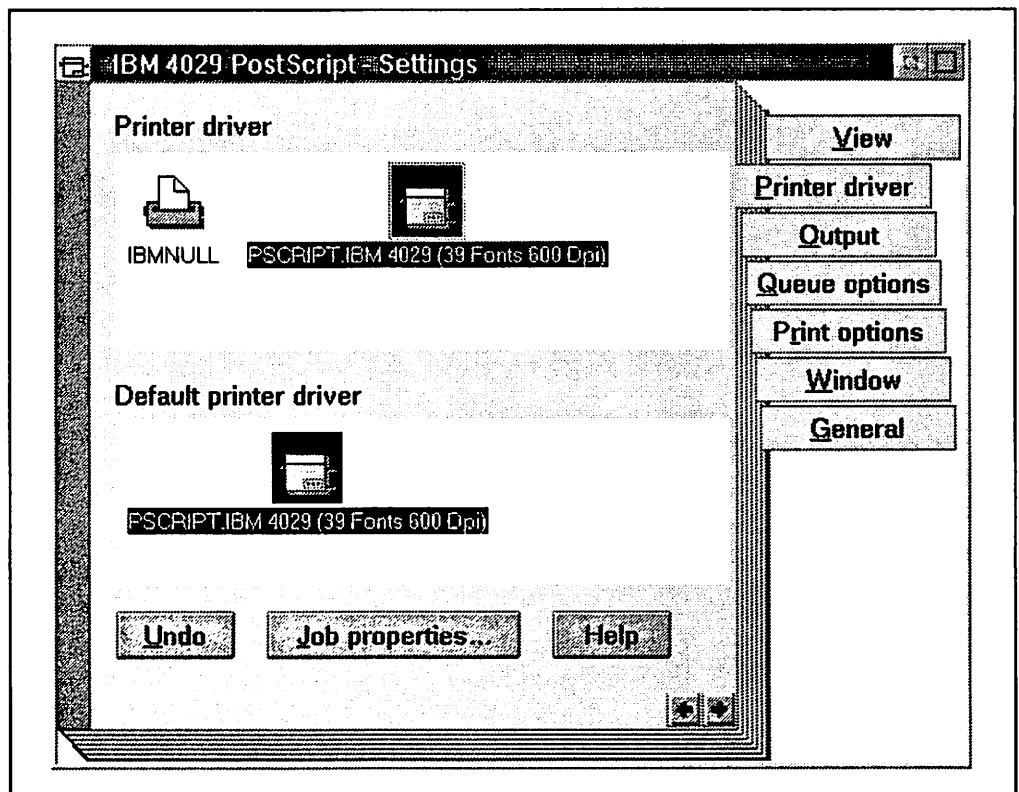


Figure 7. Printer Driver Tab of the Printer Object Settings

### 2.2.4.3 Output

The output page shows the port(s) selected and the port(s) available for this printer object. You can select a different port or more than one port (see 5.3.1, "Printer Object with Multiple Ports (Pooling)" on page 111) to route print-jobs. Instead of a port you can set up a printer object that saves your print-job as a printable file or you may select "none" by clicking on any blank space inside of the port container window. You can also redirect LPT output to another LPT port or a COM port; however, you cannot redirect output from a COM port to an LPT port. The redirection option is only available when two or more printer objects with different output ports are defined. See 2.4.5, "Redirecting a Local LPT Port" on page 33 for more details.

The **Output to file** option will allow you to specify a file name at print time if you select this printer object for output. You may type in a full path with the name of the file you wish to create on disk or diskette. This file will be created in printer specific format based on the default printer driver for the printer object. This file can then be taken to another system for printing. Remember, if you use drag-and-drop to put this file on a printer object or queue, you will be prompted for the type of data. You should make sure that the printer object uses a printer driver that supports the files' data stream and choose **Printer specific** in order to assure it prints correctly.

You can change the **Serial Port Settings** or the **Parallel Port Settings** for the ports from the Output page. See 2.4.3, "Configuring a Port" on page 32 for more details. You can also refer to Chapter 5, "Output Configurations" on page 101 for a detailed discussion on output options.

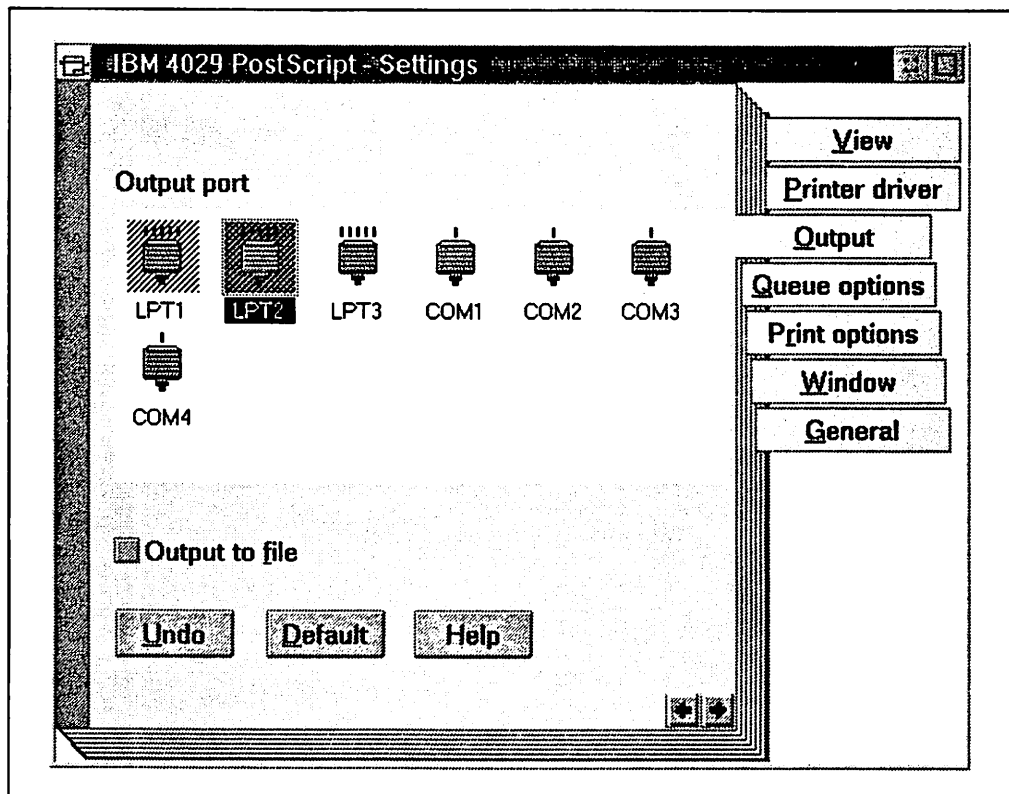


Figure 8. Output Tab of the Printer Object Settings

#### 2.2.4.4 Queue Options

Use this page to choose a **Queue driver** for this particular printer object.

The **Job dialog before print** option will display the printer object's job properties dialog *only* if you initiate printing by dragging and dropping a file on the printer object. When you print from applications, most of them allow you access to these properties using menu options like "Printer setup."

You also use this window to indicate that you want to print jobs formatted in **Printer-specific format** (PM\_Q\_RAW). You may need to create printer-specific job files for printing on a system that does not run the OS/2 2.0 operating system. This format can also speed up printing when used with **Print while spooling**. See 8.1, "PM Queued Printing (PM Applications)" on page 175 for details on PM\_Q\_RAW vs. PM\_Q\_STD.

The **Print while spooling** option allows the printer to start processing the print job before the application has finished sending the entire job to the spool queue. This "threading" will increase throughput but could cause timeout problems while printing large files with images. To solve this problem you could disable the Print while spooling option or you could increase the timeout number in the port object. The default setting is on.

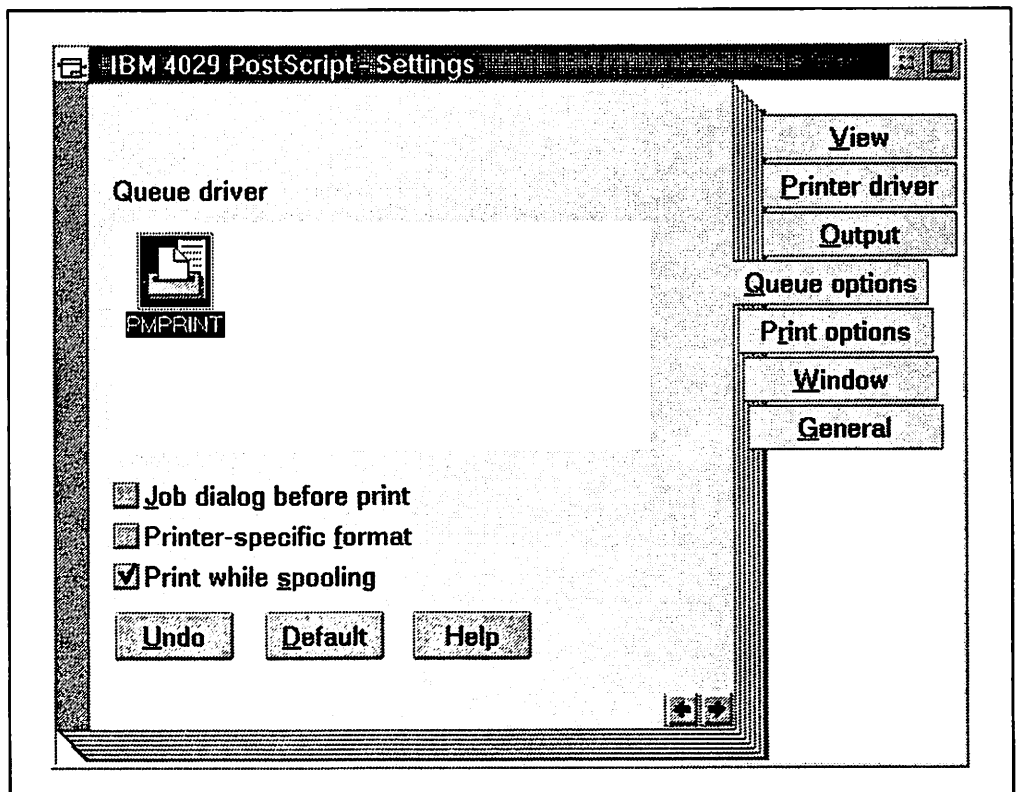


Figure 9. Queue Options Tab of the Printer Object Settings

### 2.2.4.5 Print Options

You can use the **Separator file** on this page to specify a separator page file. Separator pages are most common in a network environment and examples of separator pages for some common printers are listed in Appendix A, "Separator Page Definitions and Macros" on page 201. There are two separator files supplied with OS/2 V2.0 in the \OS2 folder. They are PSCRIPT.SEP and SAMPLE.SEP. Some printers, such as the IBM 4029, have predefined separator pages on utilities diskettes. Separator files can also be used with the IBMNULL.DRV to set printers in certain modes.

**Start Time** and **Stop Time** can be entered for each print object. We used the time settings for "meal-time" and "night-time" printing. This allows the workstation to run as fast as possible while the user is there and still be productive when the user is not there.

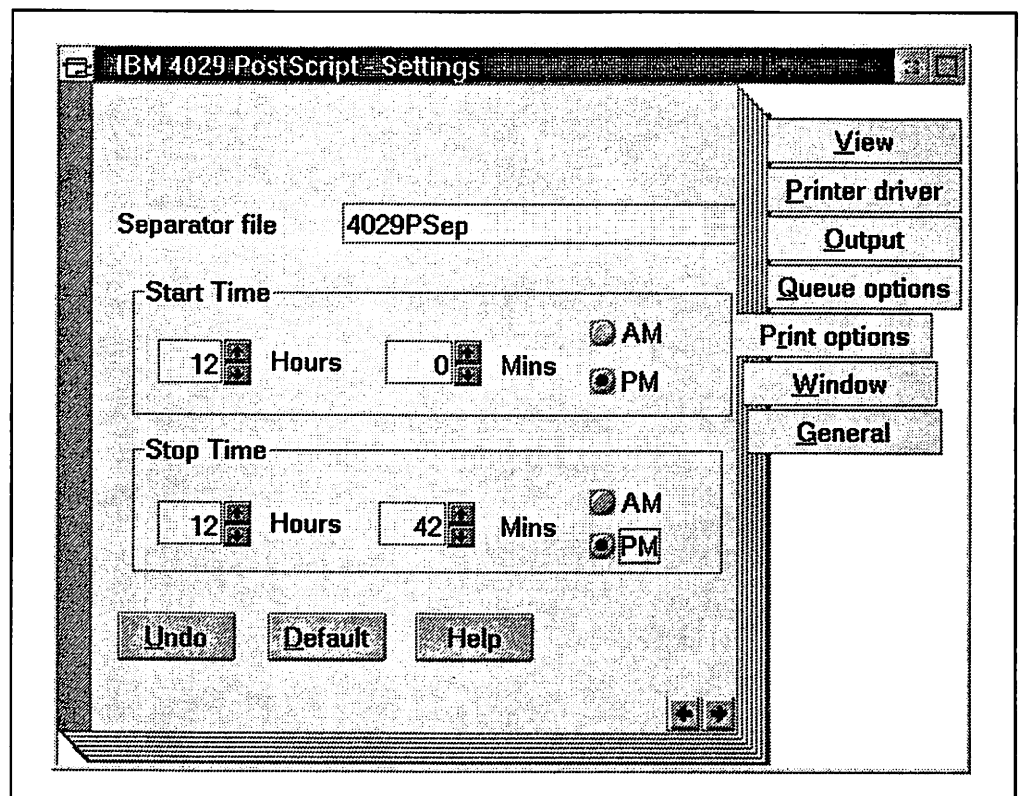


Figure 10. Print Options Tab of the Printer Object Settings

#### 2.2.4.6 Window

The window page lets you *tell* the system how you want the printer object to act when you minimize it. If you click on the **Minimize button** then you can select an entry in the **Minimize button behavior** group. This will allow you to specify that the minimized printer object window be placed on the desktop, in the **Minimized Window Viewer** or you could select **Hide window**.

Although you can change the **Object open behavior** it will have no effect on printer objects as they will always use **Display existing window**.

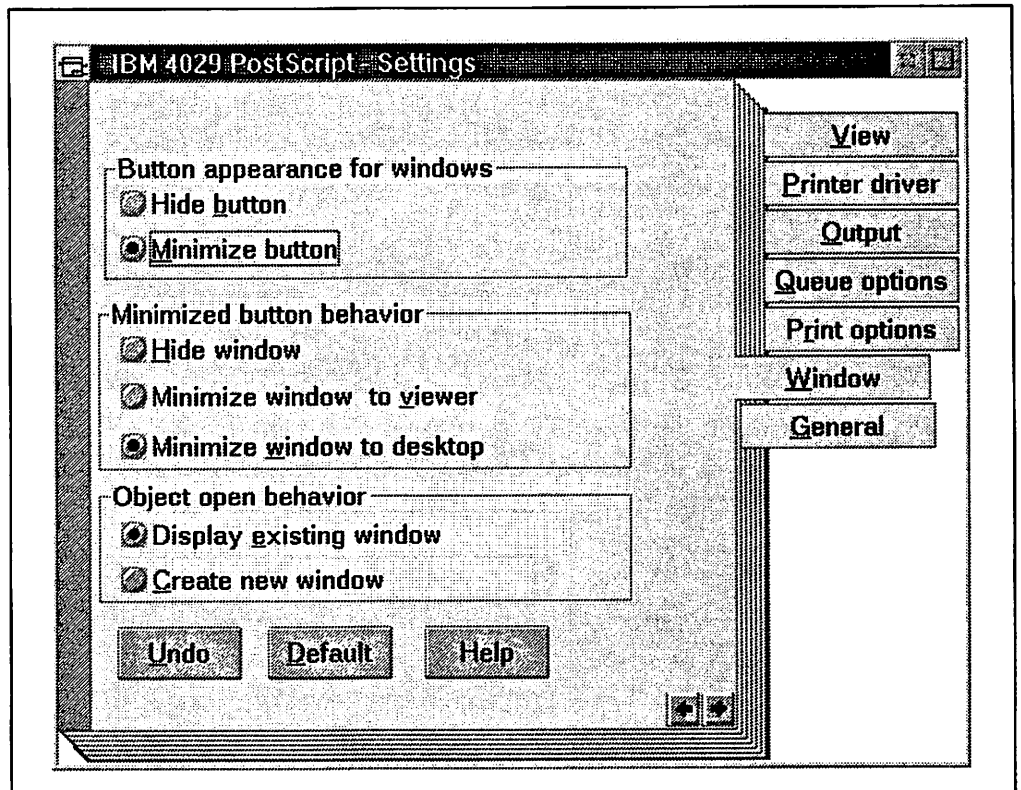


Figure 11. Window Tab of the Printer Object Settings

### 2.2.4.7 General

You can change the name of the selected object in **Title:**. You can change the icon that represents this object by using the **Create another...**, **Edit...**, or the **Find...** options.

You can click on the **Template** box to use the selected object as a template to create new printer objects with the same settings. To create new printer objects using this new template, follow the instructions in 2.2.2.1, "From the Templates Folder" on page 6 beginning with step #2.

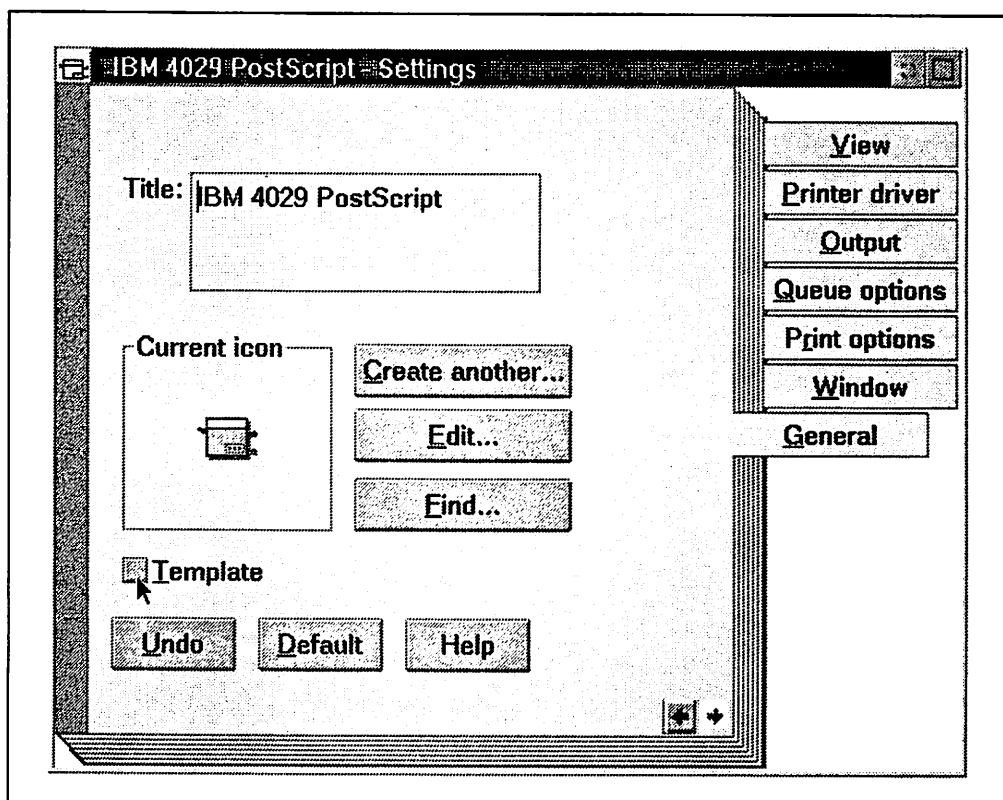


Figure 12. General Tab of the Printer Object Settings

#### Note

System templates can only be used on the system they were created on because they are dependent on entries in the OS2.INI file. If you have multiple printers on multiple systems that require the same printer configuration then you must configure them individually on each system. If your systems are on a network then you might consider installing your defined printer objects at installation time using the procedures outlined in *OS/2 Version 2.0 Remote Installation and Maintenance*, GG24-3780.

## 2.2.5 Changing the Default Printer Object

The system uses the printer object that you select as a default when you do not select another printer object through a program or a pop-up menu. For example, this is the printer that all Workplace Shell print screens will go to.

To change the default printer:

1. Display the context menu for any printer object (use mouse button 2)
2. Click on the arrow to the right of **Set default**
3. Click on any listed printer object.

A check mark indicates which printer is currently the default.

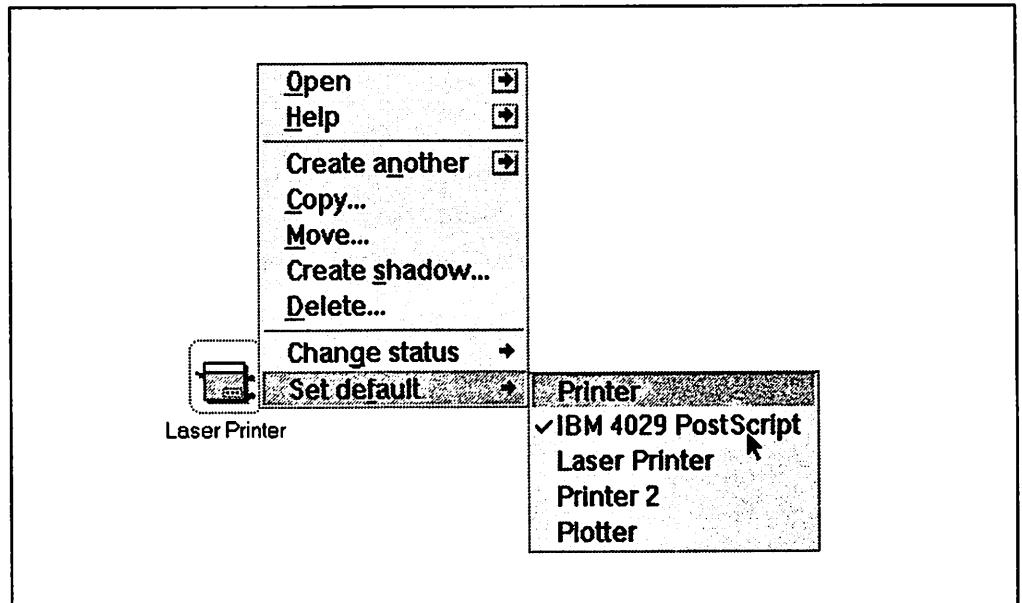


Figure 13. Selecting the Default Printer

## 2.2.6 Holding or Releasing a Printer Object

There are many reasons to hold a printer queue such as in order to perform maintenance or a requirement for a different physical paper. To do this:

1. Display the context menu for the printer object (use mouse button 2)
2. Click on the arrow to the right of **Change status**
3. Click on **Hold** or **Release**, as appropriate.

A check mark to the left of Hold or Release indicates which option is current.

## 2.2.7 Managing Job Properties

If an application does not send job properties along with the print data then the job properties set in the printer object become the default. The features that you can change vary from one print driver to the next and job properties are unique to each printer object. **Job Properties** work in conjunction with the printer driver object's **Printer Properties**.

Printer properties describe the physical setup of the printer. Printer properties are unique to each printer driver and port combination. (See 2.3.6, "Printer Properties" on page 28).



To view or change job properties:

1. Display the context menu for the printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer driver** tab
5. Click on **Job Properties**
6. View or change the job property settings as appropriate.

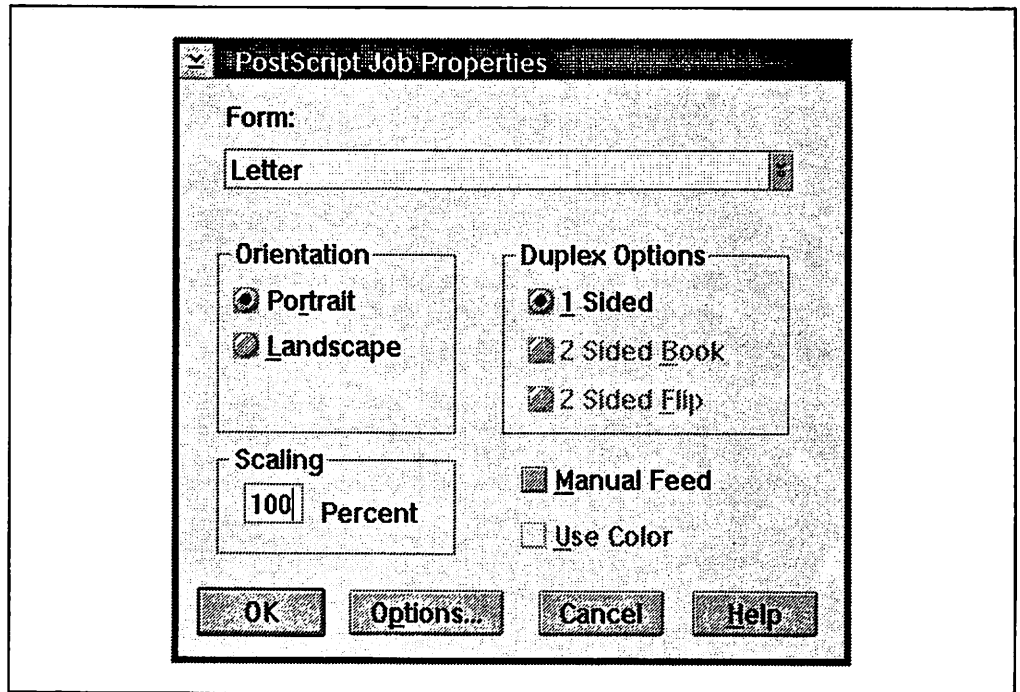


Figure 14. Job Properties for a Printer Object Using a PostScript Driver

## 2.3 OS/2 Printer Driver Object

Each printer and plotter connected to your system requires at least one printer driver. Printer drivers provide information that enables the operating system to create a data stream appropriate for the particular printer or plotter model you select for that object. The printer driver object represents the file(s) that comprise your OS/2 printer driver. Some printers can use more than one printer driver because these printers can emulate (act like) different types of printers.

### Note

It can get confusing when you are looking for printer drivers for the emulation modes of printers but it is actually quite logical. If you have an IBM 4029, for example, it can emulate a LaserJet\*\* or PostScript\*\* printer in addition to its native PPDS mode. The printer driver for the native mode is in IBM4019.DRV. The printer driver for the PCL emulation is in LASERJET.DRV. The printer driver for the PostScript emulation is in PSCRIPT.DRV. See 2.3.5, "Listing Printer Driver Diskette Contents" on page 26.

When you connect new printers or plotters, you must install the appropriate drivers. Each driver supports several printers, from which you select the specific model you need. For example, if you have a LaserJet printer, you can select LaserJet IID, LaserJet Series II, or whatever model name describes your printer. Printer drivers have printer properties to describe the physical setup of your printer. Once installed, a driver also has job properties to describe each printer object setup. For example, you use printer properties to specify which forms are loaded in which drawers, and job properties to select the form that the print-jobs will use.

Once installed, the printer driver object can be seen in one or both of the two containers on the **Printer driver** page within the settings notebook of the printer object. Printer drivers can be installed, deleted, viewed, and have settings which can be changed by the user.

For information about WIN-OS/2 printer drivers, see 2.8.1.1, "Installing a Printer" on page 44.

**Note**

OS/2 V2.0 provides some new printer drivers not available in previous versions of OS/2. However, it also has removed some of the less frequently used drivers that were in OS/2 V1.3. You can use the printer drivers from OS/2 V1.3 if the driver you need to operate a particular printer is not available on the OS/2 V2.0 printer driver diskettes. Some of these drivers are also available on bulletin board services such as Compuserve\*\*. The best solution is to find and use the latest version of a printer driver that supports your printer. If you still can't find your printer driver listed contact the manufacturer of your printer for possible sources or alternatives. If your printer emulates one of the available printer drivers you might consider using it although it may limit your ability to use all of the functions of your printer. You also might consider using the IBMNULL driver as this will simply pass the print data through to the port and the printer.

### 2.3.1 Installing an OS/2 Printer Driver Object

As previously mentioned, the only object that exists on the Workplace Shell for printing is the printer object. The installed printer driver object(s) exist "inside" of the defined printer object(s). With this in mind there are three ways to install a printer driver in OS/2:

1. During the installation of OS/2 V2.0
2. While creating a printer object
3. From an existing printer object.

**Note**

If you delete a printer driver object, the following procedures may *not* reinstall it. To do this, see 2.3.3, "Reinstall a Printer Driver File" on page 24.

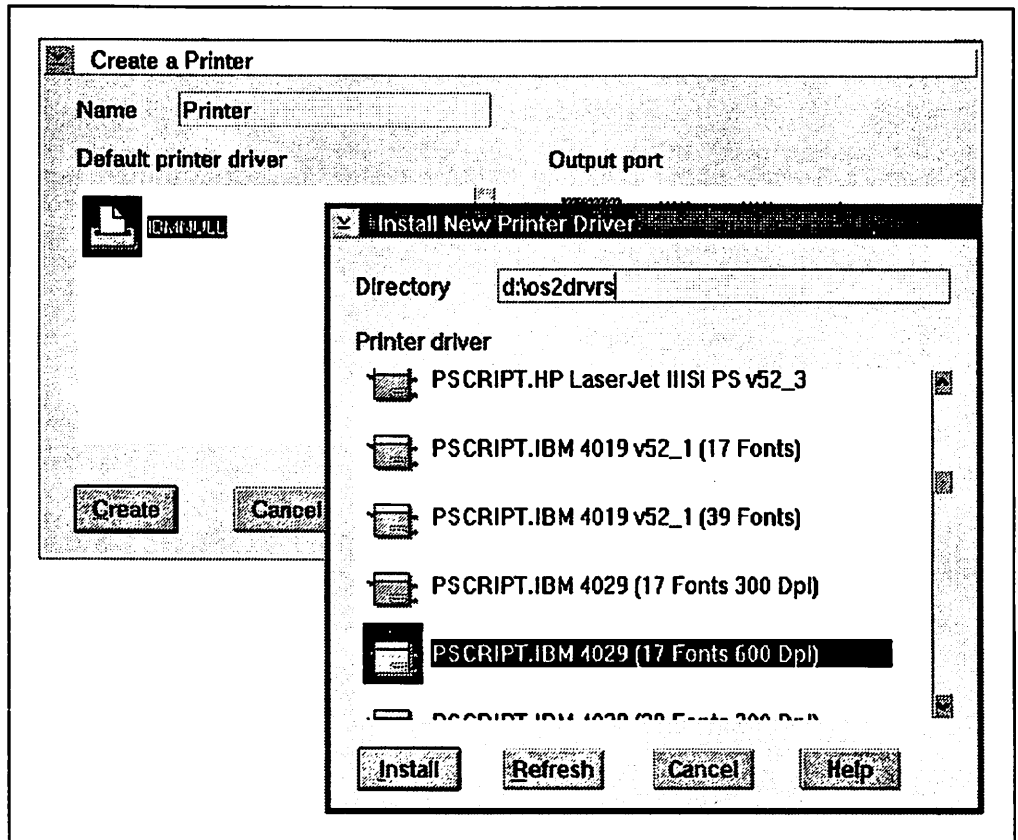


Figure 15. Installing a New Printer Driver

### 2.3.1.1 During Installation of OS/2 V2.0

When you install OS/2 V2.0 you're prompted to install a printer which will initially be used as the default. If you click on a printer to install it, the system will create a printer object, install the printer driver for the selected printer and assign it to the output port that you select. If you cancelled this initial installation of a printer the system automatically installs the IBNULL printer driver to your system but does not create a printer object. This makes sure that you will always have at least one printer driver installed from which you can install additional drivers. The system will also not allow you to delete the last remaining printer driver for this specific reason.

### 2.3.1.2 While Creating a Printer Object

In 2.2.2, "Creating a Local Printer Object" on page 6 we outlined three different ways to create a printer object:

1. From a template
2. From a printer driver file
3. From an existing printer object.

If you create a printer object from a printer driver file then the printer driver selected is automatically installed and becomes the default printer driver for that printer object. See 2.2.2.2, "From a Printer Driver File" on page 8 on how to create a printer object this way.

If you create a printer object from a template or an existing printer object then you will be presented with a Create a Printer dialog box with a Default printer

driver container. To install a printer driver in addition to those that are listed follow the steps in the next section beginning with step # 5.

### **2.3.1.3 From an Existing Printer Object**

To install a printer driver from an existing printer object:

1. Bring up the context menu of an existing printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer driver** tab
5. Display the context menu for *any* of the printer driver objects (use mouse button 2) displayed in the **Printer driver** or **Default printer driver** containers
6. Click on **Install**, which will bring up the **Install New Printer Driver** dialog
7. Insert the printer driver diskette in drive A or type in the path. If you don't know which diskette the printer driver is on see 2.3.5, "Listing Printer Driver Diskette Contents" on page 26
8. Click on **Refresh**
9. Click on the printer driver(s) you want to install
10. Click on **Install**
11. Click on **Cancel**.

### **2.3.2 Deleting an OS/2 Printer Driver Object**

To delete a printer driver, delete the printer driver object:

1. Display the context menu for any printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer driver** tab
5. Display the context menu for the driver you wish to delete (use mouse button 2)
6. Click on **Delete**.

If this driver is selected by any printer objects then a window appears showing those printer objects. You must select a different driver for each printer object listed before the driver can be deleted.

If the printer driver you wish to delete is selected in the Default Printer Driver window then select a different printer driver as the default as deletion is not possible while it is specified as the default printer driver.

If the printer driver has been "loaded" you cannot successfully delete it without rebooting your system. See 2.3.3, "Reinstall a Printer Driver File" on page 24 for an explanation of this.

You can delete all of the printer drivers except for one. This restriction will ensure that there is always one printer driver installed to help install additional printer drivers through the Workplace Shell.

### 2.3.3 Reinstall a Printer Driver File

You may need to do this if you deleted a specific printer driver but not the underlying files and you now wish to reinstall it, or, if your printer driver appears to be malfunctioning, or, if you receive a new version of an already installed printer driver.

First we have to differentiate the active state of your printer driver since you've booted your system:

- If you have already sent output to a printer object which is associated to that printer driver, or you have changed the properties of the printer driver you're going to reinstall, then its file is already loaded into memory. In this case deleting that printer driver object via the Workplace Shell removes references to it in the system files, but does not delete the printer driver files on the hard disk associated with that printer driver object! Remember that there are multiple printer driver objects in most of the printer driver files. These files will only be deleted when they are not loaded into memory *and* none of the printer objects have *any* of the printer drivers from the printer driver file assigned as default. To successfully replace the loaded printer driver follow 2.3.3.1, "Reinstall a Loaded Printer Driver."
- If you haven't sent output to a printer object that is associated with the printer driver or changed the properties of the printer driver you're going to reinstall, which means that this printer driver file isn't loaded into memory yet since you've booted your system, then follow 2.3.3.2, "Reinstall an Unloaded Printer Driver File" on page 25.

#### Note

If you have corrupted a printer driver you always have to delete it first before you can reinstall it because the installation procedure tries to optimize the installation process and will only install printer drivers of a different creation date.

#### 2.3.3.1 Reinstall a Loaded Printer Driver

To reinstall a printer driver that has been used since you have booted your system:

1. Wait for all currently-pending print-jobs to be printed, or, delete them from the printer queues of the printer objects that use printer drivers from the file you want to reinstall, and then hold the queues.
2. Display the **Settings** for every printer object on your desktop that is associated with a printer driver from the file you want to reinstall and associate these printer objects with a different printer driver.

To do this do the following for each associated printer:

- a. Display the context menu for the printer object (use mouse button 2).
- b. Click on the arrow to the right of **Open**
- c. Click on **Settings**
- d. Click on the **Printer driver** tab
- e. Click on a different driver in the **Printer driver** container
- f. Close the **Settings** dialog to save your changes.

3. Restart your system to clear its memory of any printer drivers.
4. Delete the appropriate printer driver as follows:
  - a. Display the context menu of any printer object (use mouse button 2)
  - b. Click on the arrow to the right of **Open**
  - c. Click on **Settings**
  - d. Click on the **Printer driver** tab
  - e. Display the context menu of the printer driver object you want to delete in the **Printer driver** container (use mouse button 2)
  - f. Click on **Delete**
  - g. A message box *should* appear asking whether to delete the files from your disk  
 If this message does not appear then you still have a printer object(s) with a printer driver from this printer driver file assigned as default. Go back to step 2 and assign a different default printer driver for the printer object(s).
  - h. Click on **Yes**.
5. Reinstall the appropriate printer driver(s) by following the instructions, starting with #5 in 2.3.1.3, "From an Existing Printer Object" on page 23.
6. For every printer object that needs the replaced driver, reselect the driver on the Printer driver settings page as follows:
  - a. Display the context menu for the printer object
  - b. Click on the arrow to the right of **Open**
  - c. Click on **Settings**
  - d. Click on the **Printer driver** tab
  - e. Click on the reinstalled printer driver in the **Printer driver** container.
7. Release the queues.

### 2.3.3.2 Reinstall an Unloaded Printer Driver File

To reinstall a printer driver file that hasn't been used since you booted your system, do the following:

1. Hold the queues for every printer object that uses a printer driver from the printer driver file.
2. Display the **Settings** for every printer object on your desktop that is associated with a printer driver from the printer driver file and associate these printer objects with a different printer driver.

To do this do the following for every single associated printer:

- a. Display the context menu for that printer object (use mouse button 2)
- b. Click on the arrow to the right of **Open**
- c. Click on **Settings**
- d. Click on the **Printer driver** tab
- e. Click on a different driver in the **Printer driver** container
- f. Close the **Settings** dialog to save your changes.

3. Delete the appropriate printer driver as follows:
  - a. Display the context menu of any printer object (use mouse button 2)
  - b. Click on the arrow to the right of **Open**
  - c. Click on **Settings**
  - d. Click on the **Printer driver** tab
  - e. Display the context menu of the printer driver object you want to delete in the **Printer driver** container (use mouse button 2)
  - f. Click on **Delete**
  - g. A message box *should* appear asking whether to delete the files from your disk
 

If this message does not appear then you still have a printer object(s) with a printer driver from this printer driver file assigned as default. Go back to step 2 and assign a different default printer driver for the printer object(s).
  - h. Click on **Yes**.
4. Reinstall the appropriate printer by following the instructions, starting with #6 in 2.3.1.3, "From an Existing Printer Object" on page 23.
5. For every printer object that needs the replaced driver, reselect the driver on the Printer driver settings page as follows:
  - a. Display the context menu for the printer object
  - b. Click on the arrow to the right of **Open**
  - c. Click on **Settings**
  - d. Click on the **Printer driver** tab
  - e. Click on the reinstalled printer driver in the **Printer driver** container.
6. Release the queues.

### 2.3.4 Changing the Default Printer Driver

The default printer driver is used to prepare your print-job for printing, unless your application software selects a different printer driver for the job.

To change the default printer driver:

1. Display the context menu for the appropriate printer object
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer Driver** tab
5. Click on a printer driver in the **Printer Drivers** container.

### 2.3.5 Listing Printer Driver Diskette Contents

To find out which printer driver to select for a particular printer model:

1. Insert OS/2 V2.0 printer driver diskette 1 in drive A
2. Double click on the **Drive A** icon on the Workplace Shell
3. Double click on the **PRDESC.LST** icon.

A window appears that lists supported printers and plotters by model name. The printer driver for a particular model appears after the model name.

To find out which OS/2 V2.0 printer driver diskette contains the printer driver you want:

- 1. Insert OS/2 V2.0 printer driver diskette 1 in drive A
- 2. Double click on the **Drive A** icon on the Workplace Shell
- 3. Double click on the **PRDRV.LST** icon.

A window appears that lists the printer drivers by their data file name and shows the printer driver diskette number for each.

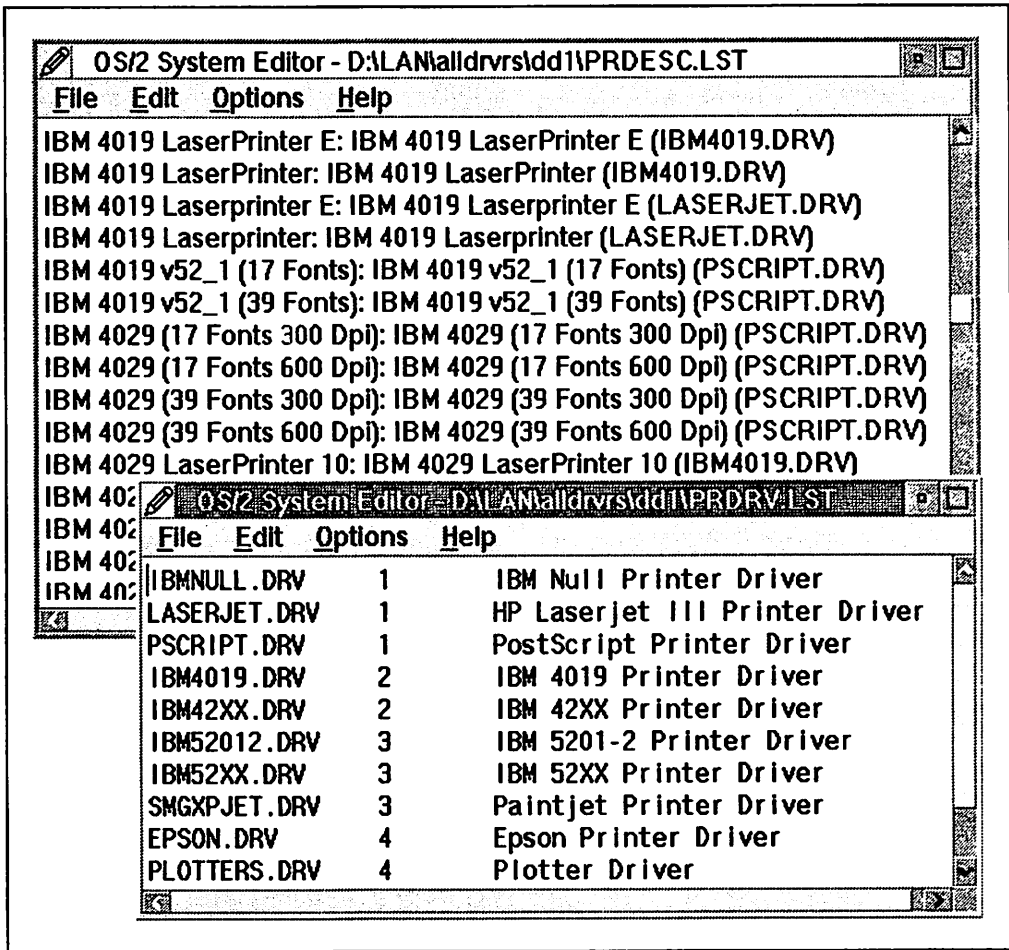


Figure 16. Listing the PRDESC.LST and PRDRV.LST Files



## 2.3.6 Printer Properties

The physical setup of your printer is described to the system through printer properties within the settings of the printer driver object.

To view or change printer properties:

1. Display the context menu for *any* printer object whose default printer driver is the one you wish to view (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer driver** tab
5. Double click on the icon for the **Default printer driver** object to display the printer properties dialog
6. View or change the printer properties as you wish.

### Note

You can also change the properties of any printer driver object which is listed in the **Printer driver** container but not used as the **Default printer driver**. However *don't* double click on this printer driver object as it would make this printer driver the *default printer driver*! Instead use mouse button 2 to bring up the context menu for it, click on the arrow to the right of **Open**, select **Settings**. This action will bring up the printer's properties dialog.

Each printer driver within each printer object has unique properties. To help illustrate that point, the following five figures show the printer properties of some of the more common printers. Notice the **Driver Version** number on each panel to help with support and service questions.

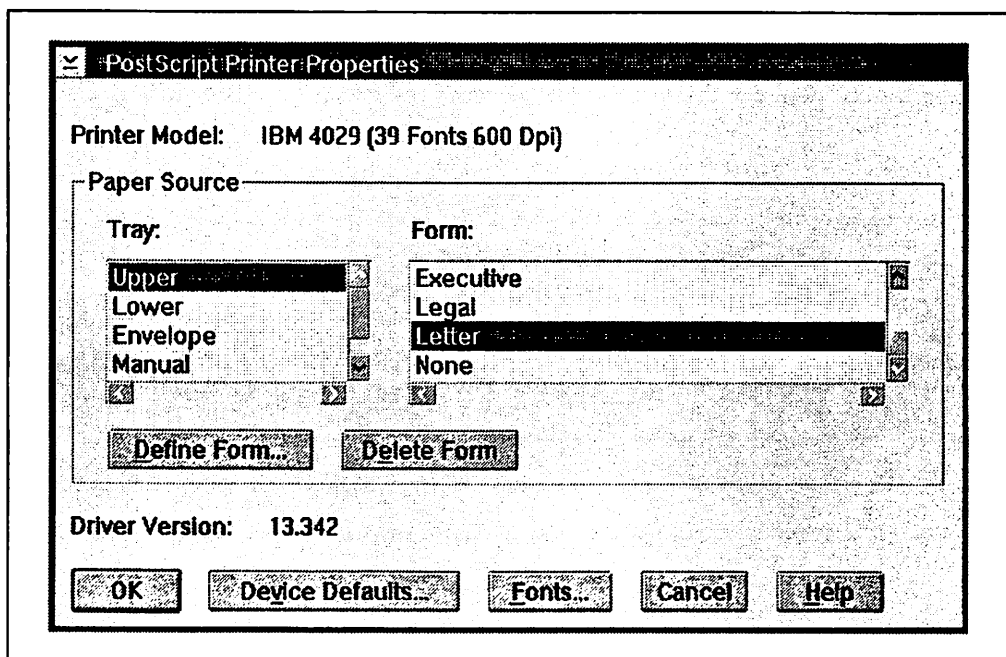


Figure 17. Printer Properties in the PostScript Driver

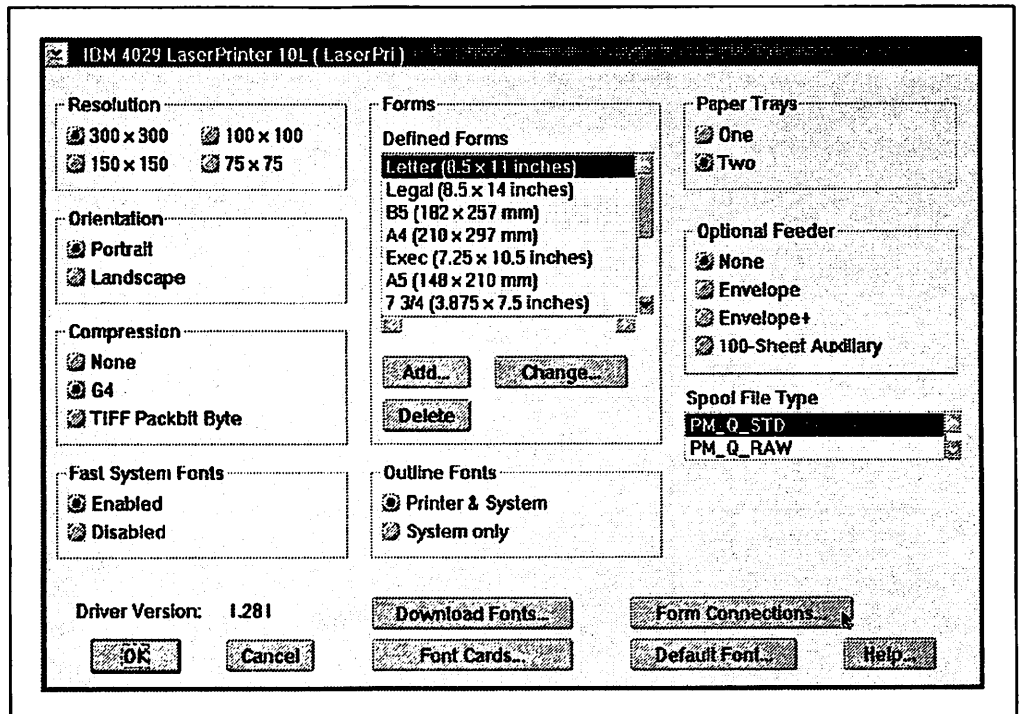


Figure 18. Printer Properties in the IBM 4029 Driver

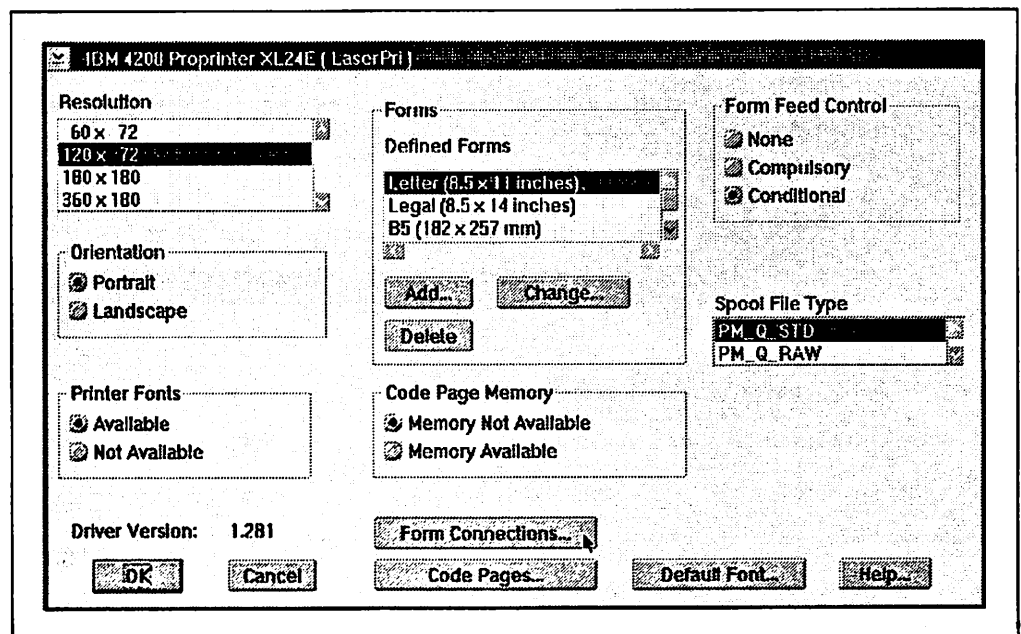


Figure 19. Printer Properties in the ProPrinter XL24E Driver

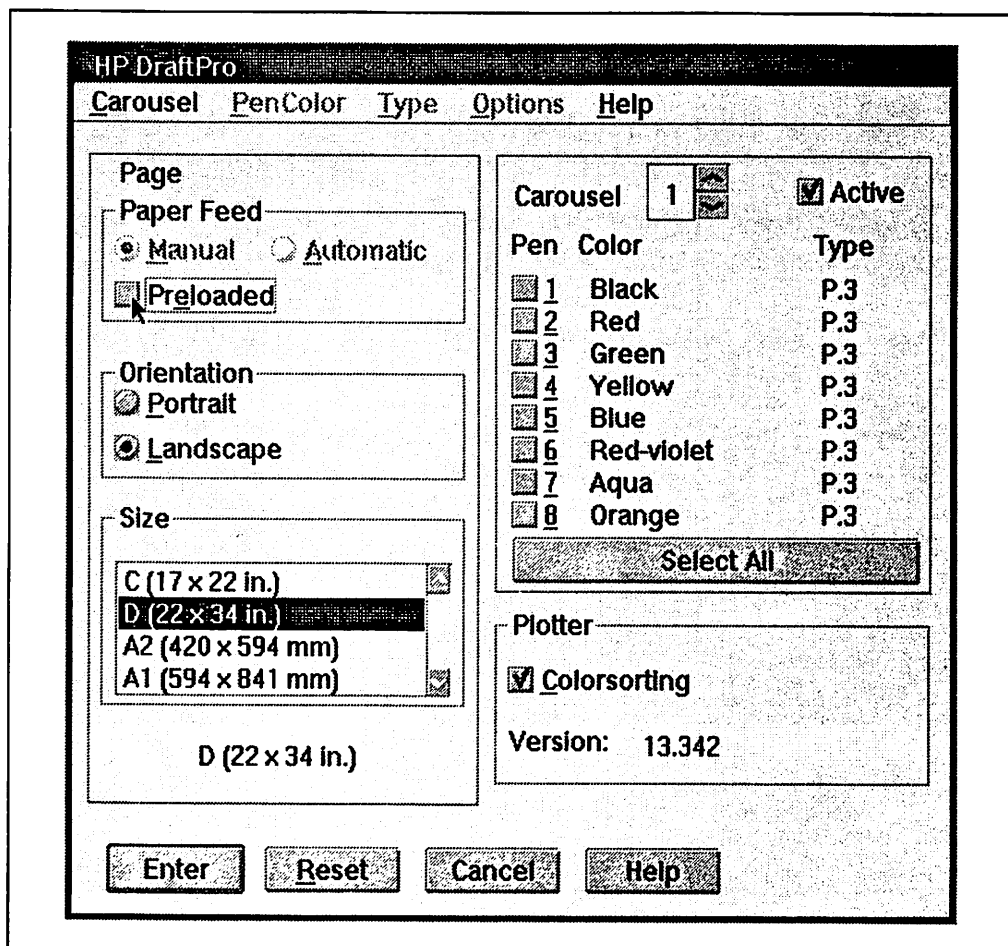


Figure 20. Printer Properties in the DraftPro Driver

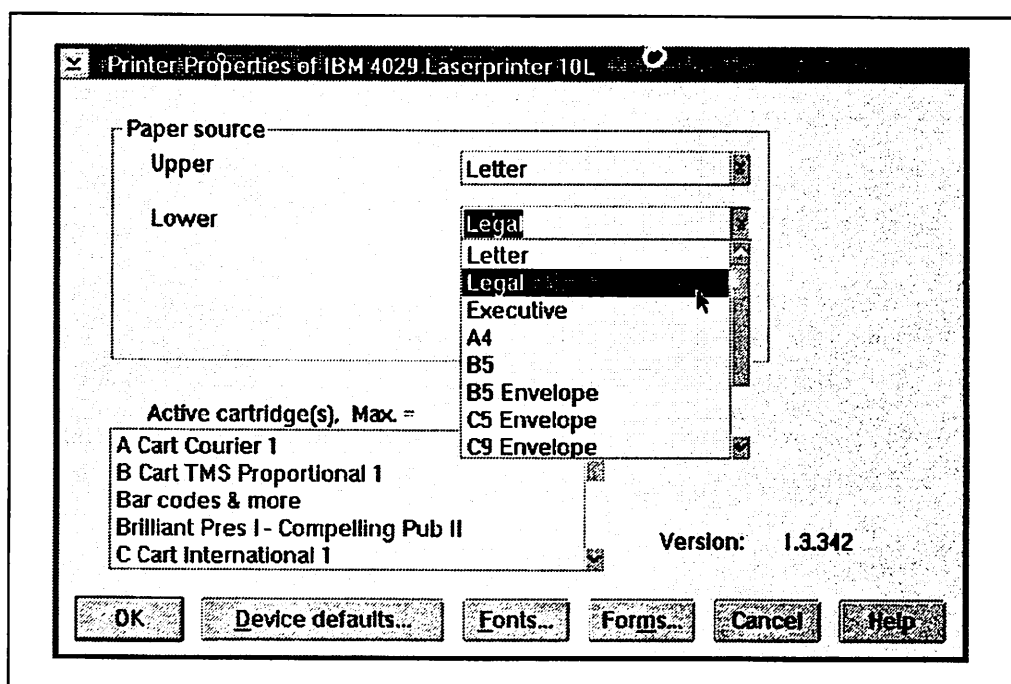


Figure 21. Printer Properties in the IBM 4029 Laserjet Driver

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## 2.4 OS/2 Port Object

The port object represents the physical port and is located within a printer object Settings notebook. From here, port objects can be installed, deleted, and have their settings changed. This feature enables you to configure port setups from within the Workplace Shell environment.

Ports can be divided into three classes,

1. Predefined physical ports such as LPT1 to LPT3 and COM1 to COM4
2. Predefined logical ports for networking or emulation switching such as LPT1 to LPT9
3. Installable ports such as COM10 to COM32.

To cope with installable ports, a callable port interface is defined in a port driver. OS/2 V2.0 supplies port drivers for parallel ports LPT1-3 and serial ports COM1-4.

For more information about port drivers, see 7.5, "Port Drivers" on page 168.

### 2.4.1 Installing Port Objects

Port objects are installed as follows:

1. Display the context menu for the appropriate printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Output** tab
5. Display the context menu for the port object (use mouse button 2)
6. Click on **Install**
7. If adding ports from a diskette then insert the diskette containing the new port object into drive A

If installing ports that are supplied with the OS/2 V2.0 operating system such as LPT1 to LPT3 or COM1 to COM4 then type \OS2\DLL in the path field.

8. Click on **Refresh**
9. Click on **Install**.

### 2.4.2 Deleting a Port Object

To delete a port object:

1. Display the context menu for the appropriate printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on the **Output** tab
4. If the port you want to delete is selected for this printer object then assign a different port or **Output to file** or select "none" by clicking on any blank space inside of the port container window
5. Display the context menu for the port you wish to delete (use mouse button 2)

6. Click on **Delete**.

If this port is selected for any other printer objects then a window appears showing those printer objects. You must select a different port for each printer object listed before deleting the port.

### 2.4.3 Configuring a Port

The parallel and serial ports have different configuration options; however, the method by which they are changed is the same:

1. Display the context menu for *any* printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Output** tab
5. Display the context menu for the port object (use mouse button 2)
6. Click on **Open**

If the port to be configured is assigned to this object you can double click on the port to open the settings. Remember, however, if you double click on a port that is not assigned to this object, *it will become the assigned port!*

7. Adjust the settings
8. Click on **OK**.

#### Note

The LPT and COM ports are preconfigured with default settings which are a starting point and will probably suffice for most purposes. However, if selecting Hardware handshake protocol in the COM settings (recommended if printing problems are encountered with large print jobs) then remember that the printer cable must conform exactly to the manufacturer's specification as timing becomes critical in this situation.

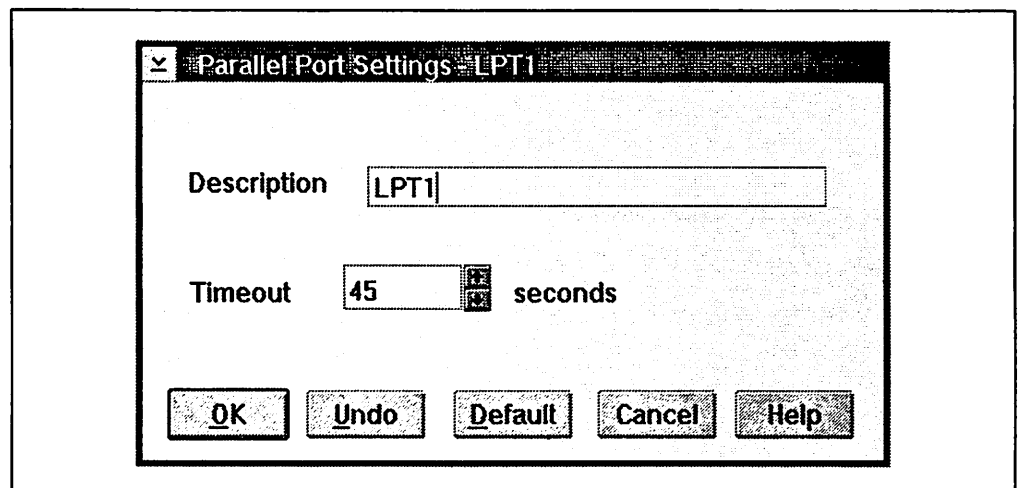


Figure 22. Parallel Port Configuration Options

### Note

If you are using a COM port with a printer from both OS/2 and WIN-OS/2 then you must set the COM port configuration in the WIN-OS/2 Control Panel under Ports to the same settings as the Serial Port Settings in the OS/2 printer object.

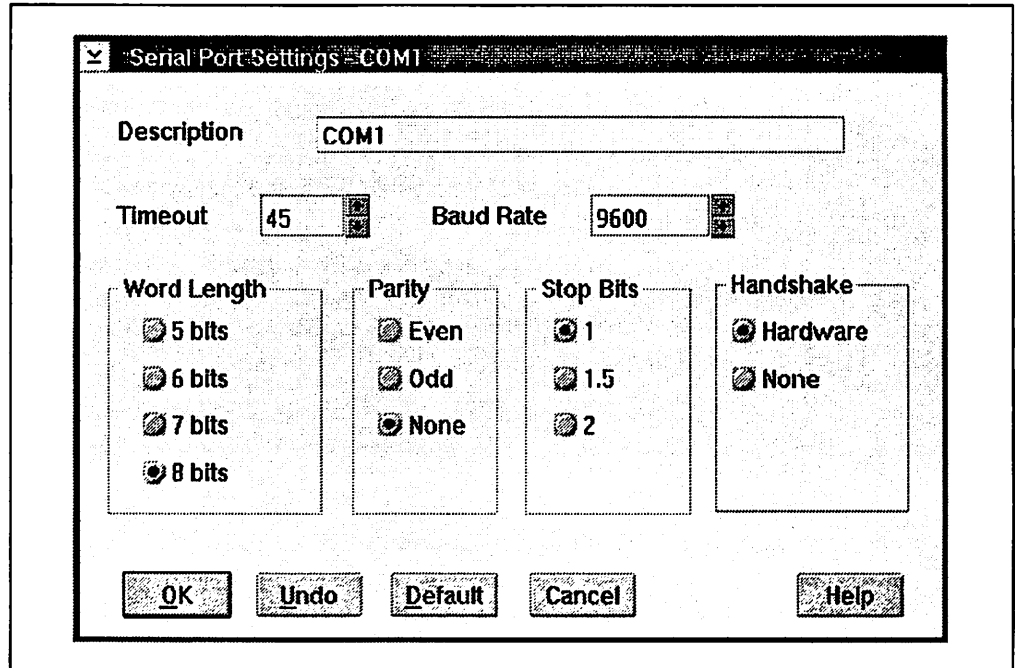


Figure 23. Serial Port Configuration Options

## 2.4.4 Assigning/Changing a Port for a Printer Object

If you move your local printer or plotter to a different port then you will need to change the port selected for any printer object associated with this printer or plotter.

To assign/change a port:

1. Display the context menu for the printer object(s) (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Output** tab
5. Click on the port(s) in the **Output port** container.

## 2.4.5 Redirecting a Local LPT Port

You can redirect any LPT port to another LPT port or COM port; however, you cannot redirect output from a COM port to an LPT port. The redirection option is only available when two or more local printer objects with different port assignments are defined in your system.

One of the reasons for using redirection is to print to COM printers from older applications that only support LPT printers. Another is to get around some of the limitations that applications have in their printer selection list. Specifically, when

you have multiple printer objects using the same output port, some applications will only show one of the printers in their list if they derive their list from the port settings. A way around this is to assign a different LPT port to each object and then redirect them back to the physical LPT port. If you are working in the Settings dialog to assign a port to a printer object then you must close the printer object's Settings dialog to save and activate the settings; don't leave it open on the Workplace Shell! It is necessary because the redirection option is not available until you have activated and saved your Settings by closing the Settings dialog. When you've done this successfully the port is ready to be redirected.

#### **2.4.5.1 Redirect Local LPT from the Workplace Shell**

To redirect a local LPT port:

1. Display the context menu for the appropriate printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Output** tab
5. Display the context menu for the LPT port you wish to redirect (use mouse button 2)
6. Click on the arrow to the right of **Redirection**
7. Click on the port you wish to redirect to.

#### **2.4.5.2 Redirect Local LPT from the OS/2 Command Prompt**

Alternatively, you can redirect an LPT port from the OS/2 command line:

1. Open **OS/2 System**
2. Open **Command Prompts**
3. Open **OS/2 Window** or **OS/2 Full Screen**
4. Type **SPOOL /D:port1 /O:port2**
5. Press the **Enter** key.

For example, to redirect LPT2 to COM1 type:

1. **SPOOL /D:LPT2 /O:COM1**
2. Press **Enter**.

To undo the redirection type:

1. **SPOOL /D:LPT2 /O:LPT2**
2. Press **Enter**.

To list the current redirections type:

1. **SPOOL /Q**
2. Press **Enter**.

## 2.5 OS/2 Job Object

Depending on the default view setting of a printer object, the print jobs are represented to the user as either job objects appearing as icons or text lines both of which display the job print status.

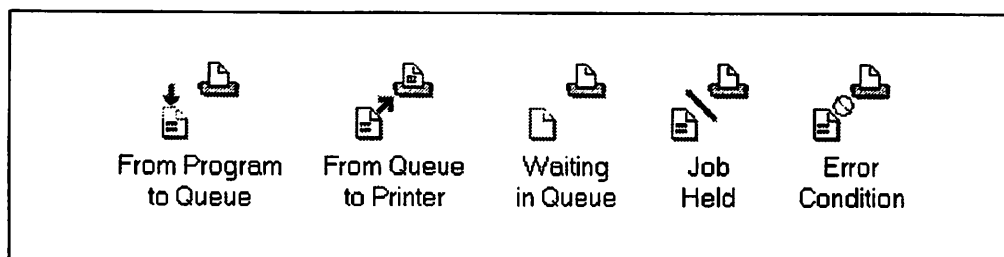


Figure 24. Print Job Status Icons

### 2.5.1 Viewing Print Jobs

Job objects are visible from within a printer object container window. Double clicking on a printer object brings up the default view, either the **Job Icon View** or the **Job Details View**. Any jobs sent to a printer object will appear in this view and the current status of a job will be indicated.

Normally, the local printer object status is updated automatically. Network printer object status is updated at every refresh interval or when you select **Refresh** from the printer object's Job Icon View context menu.

### 2.5.2 Copying a Print Job

You can duplicate a print-job while it is queued in the printer object, which is useful if you decide that you need to print an additional copy(s).

If you only need one copy:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to copy (use mouse button 2)
3. Click on **Copy**.

If you need multiple copies you can repeat the previous steps for the number of copies you need or:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to copy (use mouse button 2)
3. Click on the arrow to the right of **Open**
4. Click on **Settings**
5. Type in desired number in the **Copies** field
6. Close the settings.

Most applications also provide a dialog to specify the number of copies to print.

In all three of the previous scenarios multiple copies of the print job are created and the printer will have to rasterize each copy of each page. For text docu-



ments this is of no concern, but for PostScript graphics and image printing it could prove unacceptably slow. In that case it might be better to use the printer driver settings to specify the number of copies. This will create a print loop of the page that is already rasterized in the printer's memory. This can be done before or after a print job is created. To print additional copies of print job that is in a queue:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to copy (use mouse button 2)
3. Click on the arrow to the right of **Open**
4. Click on **Settings**
5. Click on the **Submission data** tab
6. Display the context menu for the printer driver (use mouse button 2)
7. Click on the arrow to the right of **Open**
8. Click on **Settings**
9. Type in desired number in the **Copies** field
10. Click on **OK**
11. Close the settings.

To set up a printer object to print multiple copies of all of its print jobs:

1. Display the context menu for the printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Printer driver** tab
5. Click on **Job properties**
6. Type in desired number in the **Copies** field
7. Click on **OK**
8. Close the settings.

An additional performance issue is the use of collated versus uncollated copies. While collated copies are convenient they *also* require that each page is rasterized individually. This is simple to understand as after printing the first of five copies of pages 1 through 5, the printer then needs to print the second copy of page 1. However, page 5 is currently rasterized in memory and the printer must rerasterize pages 1, 2, 3, 4, 5, then copy number three, pages 1, 2, 3, 4, 5, and so on. With uncollated copies specified, in the printer driver's job properties, the printer will print five copies of page 1, then five copies of page 2, and so on. As mentioned before, if these pages contain only text, the time difference may not be noticed. But if the pages contain images and graphics you could experience almost a five-time increase in throughput using the uncollated scenario. The manual collating at the end seems a small price to pay for this gain in throughput.

### 2.5.3 Deleting Print Jobs

This can be done as follows:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to delete (use mouse button 2)
3. Click on **Delete**.

If you wish to delete *all* of the jobs in a queue then display the system menu of the queue (click mouse button 2 on the upper-left corner icon) and click on **Delete all jobs**.

### 2.5.4 Changing Print Job Priority

To cause a particular print job to print before any other queued job:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to print next (use mouse button 2)
3. Click on **Print next**.

You can change the priority of a print job so that it can print before or after other jobs queued.

To do this:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to re-prioritize (use mouse button 2)
3. Click on the arrow to the right of **Open**
4. Click on **Settings**
5. Change the value in the **Priority** field.

#### Note

Once a job has started printing it is no longer possible to change its priority, the **Settings** option is not available.

### 2.5.5 Holding or Releasing a Print Job

A job can be held by holding the queue the job is in. However, you may only want to hold one particular job to be printed later.

This can be done as follows:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to hold (use mouse button 2)
3. Click on the arrow to the right of **Change Status**
4. Click on **Hold** or **Release**.

## 2.5.6 Restarting a Print Job

You can restart a print-job that is currently printing, as follows:

1. Double click on the printer object to which the job has been sent to bring up the default view
2. Display the context menu for the job you wish to restart (use mouse button 2)
3. Click on **Start again**.

### Note

You can only restart a job that is currently printing. If the job is queued but not printing then the **Start again** option is not available.

## 2.5.7 Viewing Print Job Content

The actual job content of a queued job can be displayed quite easily, as follows:

1. Double click on the printer object to which the job has been sent to bring up the default job view.
2. Double click on the job object (icon view) or the job information line (details view).

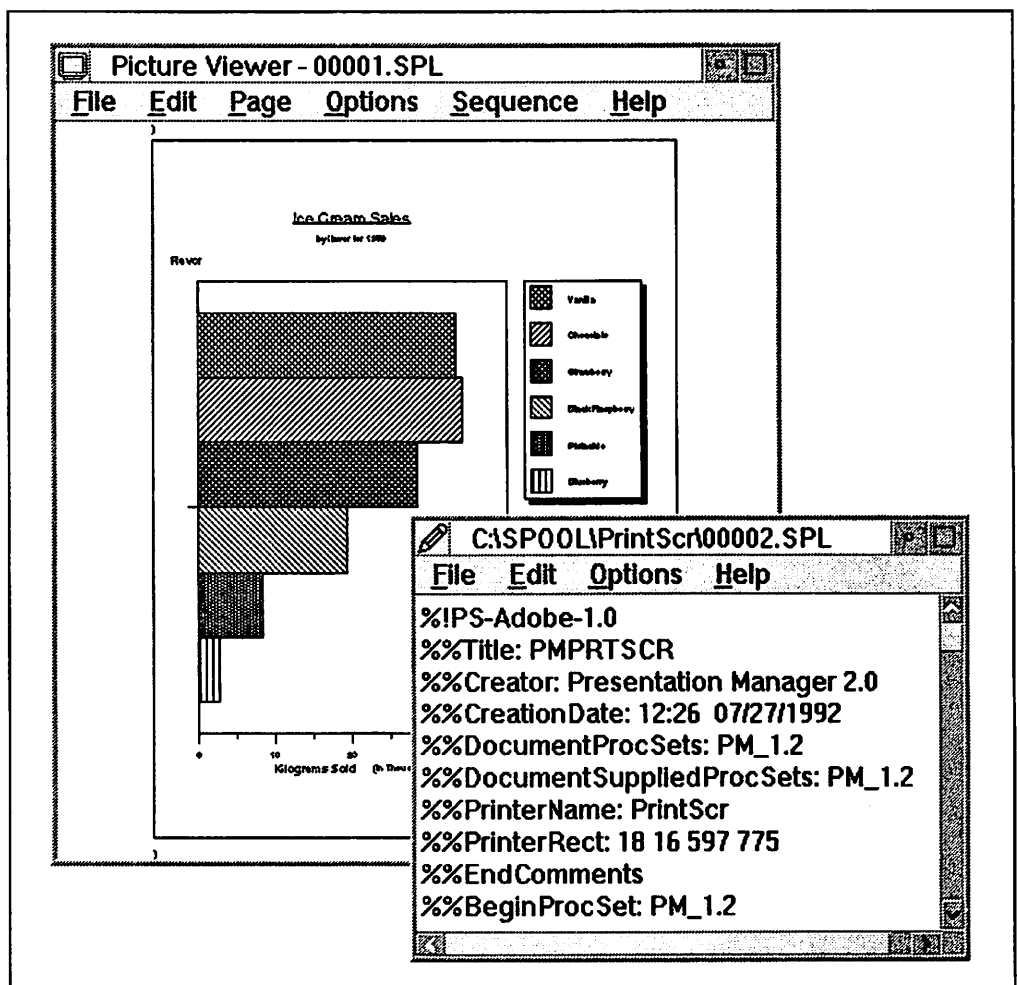


Figure 25. The Two Different Types of Print Job Content

#### Note

For jobs queued using the PM\_Q\_STD spool file data format, the Picture Viewer program is invoked to view the spool file content. For PM\_Q\_RAW formats, the System Editor is used.

For more information about spool file formats, see 7.2.2, "Spool File Formats" on page 159.

## 2.6 OS/2 Queue Driver Object

The queue driver is presented to the user as a queue driver object. The queue driver is called upon by the spooler to pass queued print-jobs on to the printer driver. Queued jobs are spooled (written) to a file on the hard drive where they wait until it is their turn to be printed. Queue driver objects can be installed, deleted and changed. There are two queue drivers shipped with OS/2 2.0, PMPRINT and PMPLOT. These drivers are managed through the **Queue options** page in the settings notebook for the particular printer object. For more information about queue drivers, see 7.6, "Queue Drivers" on page 169.

### 2.6.1 Installing a Queue Driver

During system installation the PMPRINT queue driver is installed onto your system even if you don't choose a printer to be installed during the installation of OS/2 V2.0. If your plot output looks incorrect then you may want to use the PMPLOT queue driver.

To install the PMPLOT or another queue driver:

1. Display the context menu for *any* printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on **Queue options**
5. Display the PMPRINT context menu (use mouse button 2)
6. Click on **Install**
7. Insert the diskette containing the queue driver into drive A (presently PMPLOT.QPR is on OS/2 V2.0 Printer Driver Diskette #5)
8. Click on **Refresh**
9. Click on **Install**.

If you used PMPLOT under OS/2 1.3 you also had to install an additional printer driver in order to perform reverse clipping. In OS/2 V2.0 this is done automatically. The printer driver that is installed is PMPLOTPD.DRV and it works along with the default printer driver in the printer object. See 7.6.2, "PMPLOT" on page 170 for more details on the use of PMPLOT.

## 2.6.2 Changing the Queue Driver

Most printers *and* plotters can use the queue driver named PMPRINT. If you want to use PMPLOT, or another installed queue driver, then you can select it as follows:

1. Display the context menu for the printer object through which you want to plot (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Queue options** tab
5. In the **Queue driver** container, click on the icon that represents the new queue driver.

## 2.6.3 Deleting a Queue Driver

To delete a queue driver object:

1. Display the context menu for any printer object (use mouse button 2)
2. Click on the arrow to the right of **Open**
3. Click on **Settings**
4. Click on the **Queue options** tab
5. If the queue driver you wish to delete is selected for this printer object then select a different queue driver
6. Display the context menu for the queue driver you wish to delete (use mouse button 2)
7. Click on **Delete**.

### Note

If the queue driver you wish to delete is selected for any other printer object then a window will appear showing these printer objects. Display the settings for each printer object listed and select a different queue driver than the one you wish to delete.

You cannot delete the last queue driver. The system will always make sure that one is installed.

---

## 2.7 OS/2 Spooler Object

The OS/2 spooler object initially resides in the **System Setup** folder which resides in the **OS/2 System** folder. It represents the settings of the OS/2 spooler and *not* its content. Through the spooler object, the spooler can be disabled, enabled (default state), and its spool path (to the hard drive) can be changed. For more information about the spoolers, see 7.2, "Spoolers" on page 156.

## 2.7.1 Disabling the Spooler

We recommend that the OS/2 spooler *always* be enabled. If, however, you need to use an older DOS or Windows application that is not “well behaved,” then you may have to disable the spooler in order to print.

To disable the spooler:

1. Double click on the **OS/2 System** icon
2. Double click on the **System Setup** icon
3. Display the context menu for the **Spooler** (use mouse button 2)
4. Click on **Disable Spooler**
5. You will be prompted to restart your system as this change does not come into effect until your system is rebooted.

If you disable the spooler then the print subsystem has no way of keeping your print-jobs separated. This means that if the system has more than one job request then it sends each part of a print-job directly to the printer and so partial job data from the various jobs arrive at the printer in the order they were sent to it. To keep your print-jobs separate, either enable the spooler or wait for each print-job to finish printing before sending the next.

## 2.7.2 Enabling the Spooler

The default state for the spooler is enabled. However, you may have disabled the spooler and now wish to enable it again.

To enable the spooler:

1. Double click on the **OS/2 System** icon
2. Double click on the **System Setup** icon
3. Display the context menu for the **Spooler** (use mouse button 2)
4. Click on **Enable Spooler**.

### Note

Unlike disabling the spooler, this change takes effect immediately so there is no need to restart your system.

## 2.7.3 Changing the Spooler Path

If your print usage is heavy and/or your print jobs are very large you may assign a different drive or path that has more space than your install drive.

To change the spooler path:

1. Wait until all your pending print-jobs have finished printing or delete them
2. Display the printer object context menu (use mouse button 2)
3. Click on **Change Status**
4. Click on **Hold** for all of your printer objects
5. Double click on the **OS/2 System** icon
6. Double click on **System Setup** icon

7. Double click on the **Spooler** object icon
8. Click on the **Spool path** tab
9. Type your new path in the **Spool Path** entry field
10. Close the **Spooler-Settings** window
11. Display the printer object context menu (use mouse button 2)
12. Click on **Change Status**
13. Click on **Release** for all of your printer objects.

If your printer(s) are locally attached and only accessed by your system then you should not have to hold and then release the printer objects once they are empty. On a network, however, this precaution is mandatory.

---

## 2.8 WIN-OS/2

WIN-OS/2 print support is provided through the WIN-OS/2 Print Manager, Control Panel and ATM Control Panel user interfaces. The WIN-OS/2 user interface is accessed through a WIN-OS/2 full screen or a WIN-OS/2 windowed session. By using a WIN-OS/2 windowed session, it is possible to display the WIN-OS/2 user interface on the Workplace Shell. The "seamless" WIN-OS/2 gives you the opportunity to run a Windows program on the Workplace Shell.

The WIN-OS/2 Print Manager and Control Panel provide the user the management and configuration options (respectively) for printing from WIN-OS/2 applications. The ATM Control Panel is used to manage fonts for WIN-OS/2 printers.

You may want to have the WIN-OS/2 Print Manager and Control Panel icons on your Workplace Shell desktop if you manage printers frequently. There are two ways to do this:

1. You can use the Migrate Applications program in the System Setup folder. However this will place the icon in a folder called "Additional Windows Programs." You will then have to open that folder and drag-and-drop the icons onto your desktop.
2. You can also open the Templates folder and drag-and-drop the Program icon on your desktop and type in the prompts.
  - Use the following paths for each desired program:
    - \OS2\MDOS\WINOS2\CNTRL.EXE for the Control Panel
    - \OS2\MDOS\WINOS2\PRINTMAN.EXE for Print Manager
    - \OS2\MDOS\WINOS2\ATMCNTRL.EXE for the ATM Control Panel
  - Use \OS2\MDOS\WINOS2 for your working directory.
  - Under Session select WIN-OS/2 window if available, otherwise select WIN-OS/2 full screen.

### Note

You can only display windowed and/or "seamless" WIN-OS/2 applications if your system was configured for a display resolution that supports this. This also affects the ability to print from WIN-OS/2 while the Workplace Shell is displayed. If you are not using a supported resolution *and* you have print jobs pending from WIN-OS/2, when the Workplace Shell is displayed those print jobs will be suspended.

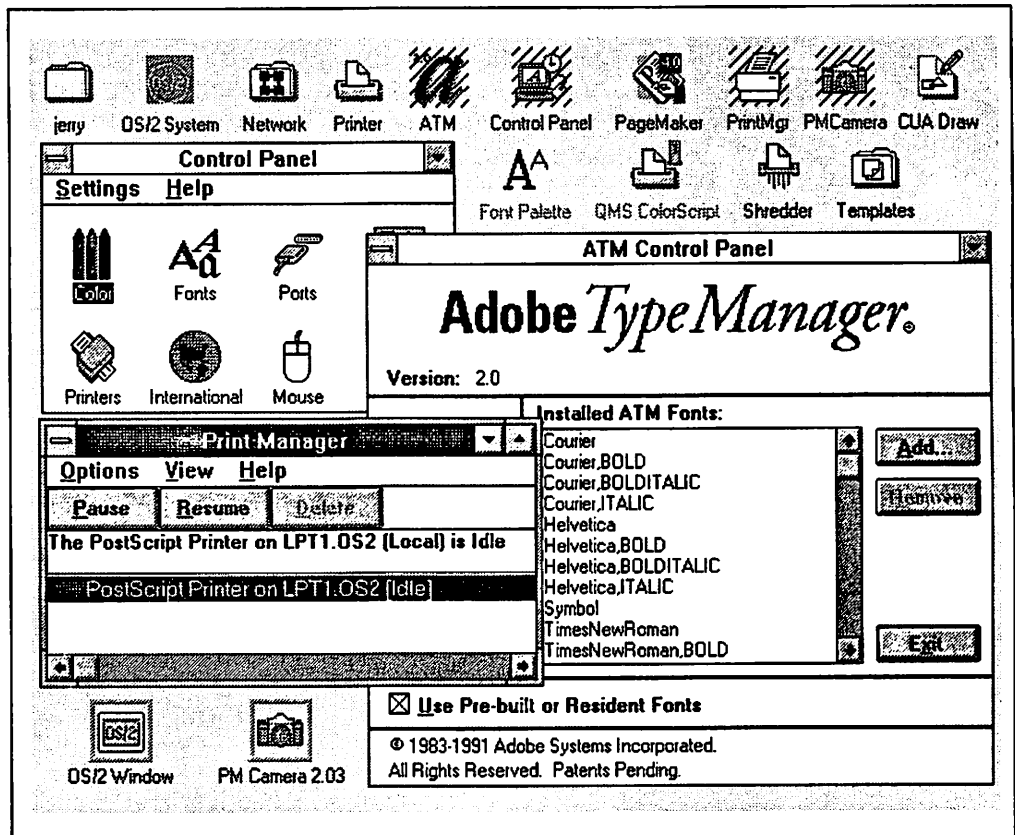


Figure 26. WIN-OS/2 Print Components Running on the Workplace Shell

## 2.8.1 WIN-OS/2 Control Panel

The WIN-OS/2 Control Panel enables you to configure your WIN-OS/2 printers and ports. To configure a printer for use with WIN-OS/2 you have to perform the following steps:

1. Install the printer driver
2. Assign an output port
3. Select a printer type (some drivers)
4. Change printer settings if required
5. Make the printer active.



### 2.8.1.1 Installing a Printer

During installation of an OS/2 V2.0 printer driver you may be prompted by a message box asking you "Do you want to install the equivalent WIN-OS/2 printer driver?" If you selected "Yes" then the system prompted you to place the appropriate diskette in drive A. If you said "No," or were not prompted, and you want to print to the printer from a WIN-OS/2 session then you must install the printer in the WIN-OS/2 Control Panel. Refer to the notes under 2.2.2.1, "From the Templates Folder" on page 6 regarding the OS/2 prompt.

#### Warning

If you are installing the IBM 4029 PostScript printer driver from the Control Panel list it will not install correctly! The problem is that the description contains a comma. For example: IBM 4029 v52.3(17 Fonts,300 Dpi). In order to use your IBM 4029, either use one of the IBM4019 PostScript drivers or, select "Unlisted Printer" from the Control Panel list and insert the OS/2 V2.0 printer driver diskette with the WIN-OS/2 4019 printer driver. You can then install the desired 4029 driver correctly.

To install a printer along with its appropriate driver:

1. Double click on the WIN-OS/2 **Control Panel** icon
2. Double click on the **Printers** icon
3. Click on **Add Printer>>**. If no printers are installed then WIN-OS/2 automatically selects add printer for you
4. Click on the printer you wish to install from the **List of Printers**

These are the printers for which WIN-OS/2 has printer drivers. If your printer is not listed then you should check your printer manual to see if your printer emulates one of the printers that WIN-OS/2 supports. If so then you can use one of the printer drivers supplied with WIN-OS/2 to support your unlisted printer.

If WIN-OS/2 does not list a printer driver that supports your particular printer but you have a printer driver for that printer supplied by the manufacturer then select **Unlisted Printer** from the **List of Printers**.

5. Click on **Install**

If a printer driver for the printer is already on the system then WIN-OS/2 will ask if you want to use that driver or install a new one. Click on **New** to install a new version of the driver. Click on **Current** to use the existing printer driver.

6. If you click on **New** or the printer driver is not on the system, insert the printer driver diskette requested in drive A or type in the path and click on **OK**
7. If the Control Panel prompts you for font files then insert the font file diskette in drive A and click on **OK**.

The printer name then appears in the **Installed printers** list. Before you can use the printer, you must complete the other installation steps.

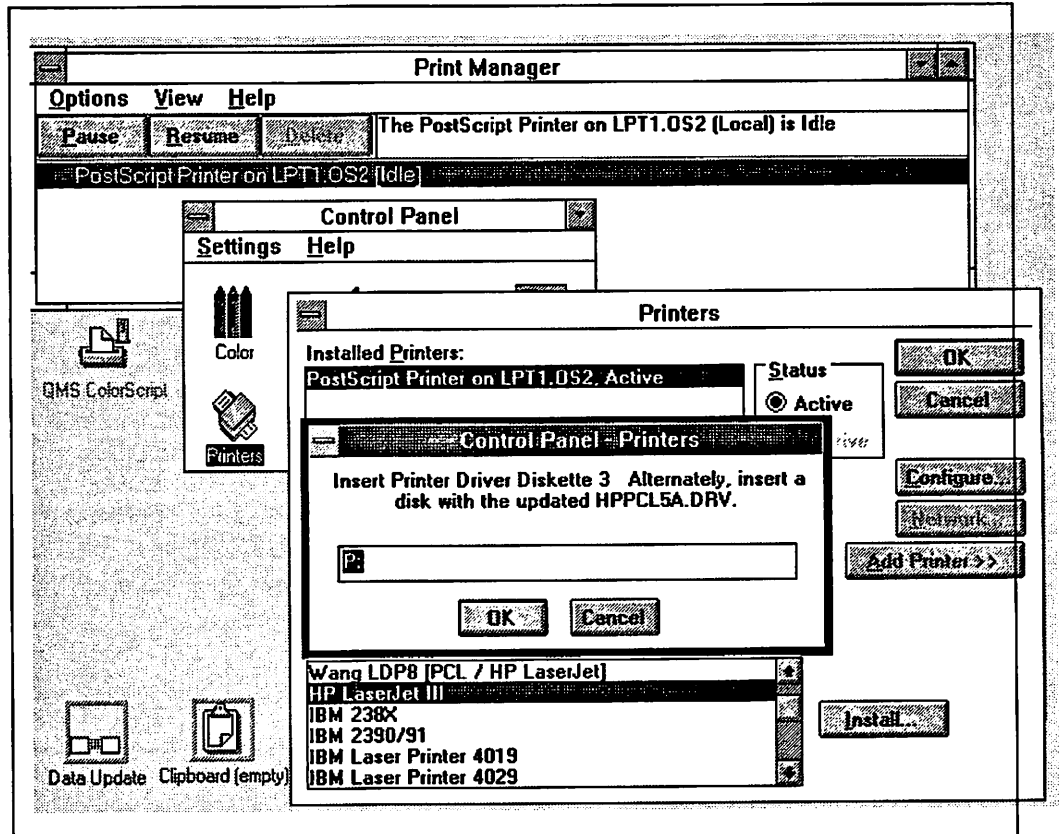


Figure 27. Installing a WIN-OS/2 Printer and Printer Driver

### Important!

If the assigned port for the WIN-OS/2 printer is not assigned to any OS/2 V2.0 printer object, then the WIN-OS/2 print file will be sent directly to the physical port.

This kind of configuration gives you no management facilities for the print-job or print queue from the OS/2 V2.0 Workplace Shell and no management facilities for LPTx directed print-jobs within the WIN-OS/2 *Print Manager*.

It is therefore recommended that you *always* install equivalent printer queues in OS/2 V2.0 Workplace Shell for your WIN-OS/2 printers even if you are only going to print to them from WIN-OS/2.

If there is no equivalent OS/2 V2.0 printer driver available then use the IBMNULL printer driver in the OS/2 V2.0 printer object.

### 2.8.1.2 Assigning a Printer Port

If the Printers dialog box for WIN-OS/2 is open then proceed with step one. If the Printers dialog box is not open then double click on the Printers icon in the Control Panel window in the Main Group in the WIN-OS/2 Program Manager, then:

1. Click on the printer in **Installed Printers**
2. Click on **Configure**
3. Click on the port

If you select a serial (COM) port then you may also need to configure the port. You can also select **File** to print the output to a disk file. If you choose **File** then WIN-OS/2 asks you to type in the name of a file each time you print.

4. Click on **OK**.

If you are installing a new printer then you must complete the other installation procedures before you can use the printer.

**Note**

It is recommended that you select LPT ports with the .OS2 extension. They will provide improved performance over the standard LPT port assignments.

If you need access to LPT3.OS2 or logical ports LPT4.OS2 through LPT9.OS2 you need to edit the WIN.INI file located in \OS2\MDOS\WINOS2. Go to the (ports) section of the WIN.INI file and insert lines for the desired ports. You must restart WIN-OS/2 in order to see and use these changes. These ports will then become selectable when you configure your printers in the WIN-OS/2 Control Panel.

**Adding ports to WIN.INI.**

```
(ports)
; A line with (filename).PRN followed by an equal sign causes
; (filename) to appear in the Control Panel's Printer Configuration dialog
; box. A printer connected to (filename) directs its output into this file.
LPT1.OS2=
LPT2.OS2=
LPT3.OS2=
LPT4.OS2=
LPT5.OS2=
LPT6.OS2=
LPT7.OS2=
LPT8.OS2=
LPT9.OS2=
FILE:=
EPT:=
LPT1:=
LPT2:=
LPT3:=
COM1:=9600,n,8,1
COM2:=9600,n,8,1
COM3:=9600,n,8,1
COM4:=9600,n,8,1
```

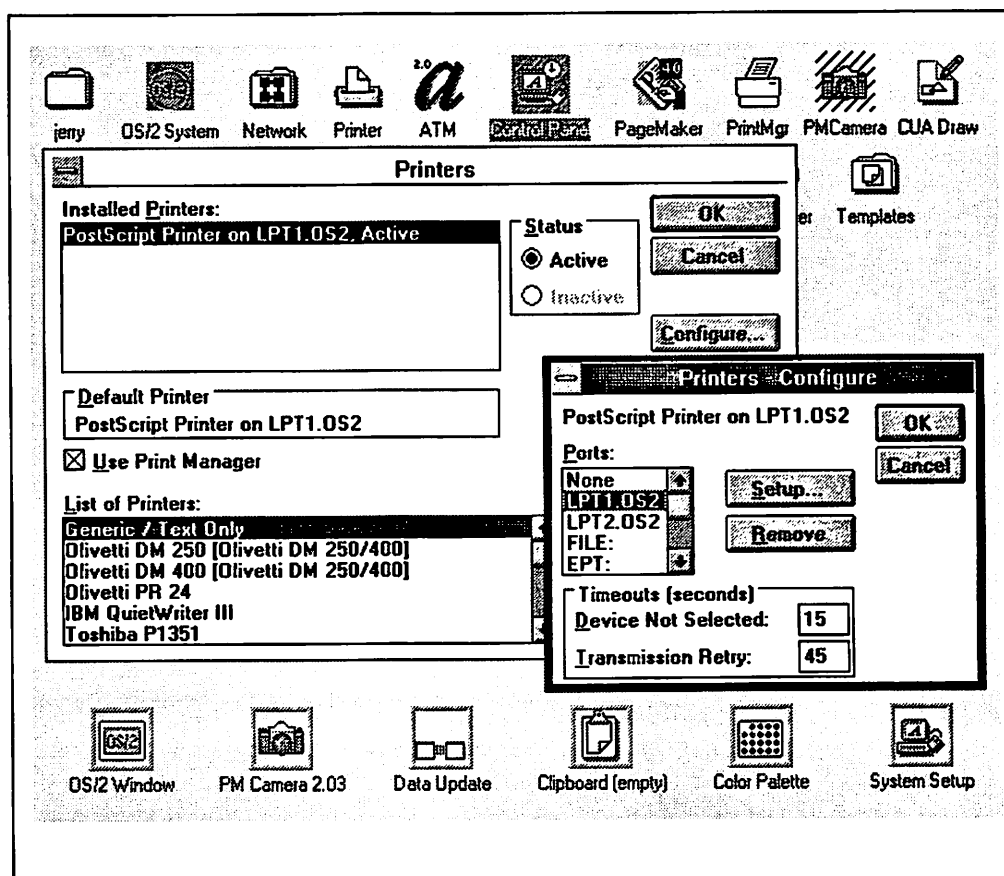


Figure 28. Configuring Printer in WIN-OS/2

### 2.8.1.3 Active Printer for a Port

More than one printer can be assigned to each port but, unlike the printer objects in the OS/2 Workplace Shell, only one printer can be *active* on a port.

If the Printers dialog box for WIN-OS/2 is open then proceed with step one. If the Printers dialog box is not open then double click on the Printers icon in the Control Panel window in the Main Group in the WIN-OS/2 Program Manager, then:

1. Click on a printer from the **Installed Printers** list

Note: You must choose a printer that is not assigned to **None**.

2. Click on **Active** or **Inactive** in the **Status** box.

Note: The default printer cannot be made inactive.

If you are installing a new printer then your printer *may* be ready for use. You should still read through the following sections to see if any of them apply to this particular printer.

### 2.8.1.4 Choosing the Default Printer

If the Printers dialog box for WIN-OS/2 is open then proceed with step one. If the Printers dialog box is not open then double click on the Printers icon in the Control Panel window in the Main Group in the WIN-OS/2 Program Manager, then:

1. Double click on an active printer in the **Installed Printers** list. The **Default Printer** area shows the current default printer used by WIN-OS/2 and Windows applications that use this setting.
2. Click on **OK**.

### 2.8.1.5 Choosing Printers to Use with Printer Drivers

In certain printer drivers such as the LaserJet or PostScript printer driver, the name of the printer you selected from the list during installation and the printer name showing up in the Setup dialog usually do not match after initial installation. This is because different *kinds* of printers can use the same printer driver. You must tell WIN-OS/2 which printer to use with which printer driver.

To select a printer:

1. Double click on the **Printers** icon in the **Control Panel** window of the WIN-OS/2 **Program Manager**
2. Click on the printer in the **Installed Printers** list
3. Click on **Configure**
4. Click on **Setup**
5. Click on the down arrow next to the current printer name
6. Click on the appropriate printer name
7. Click on **OK**
8. Click on **OK**
9. Click on **OK**.

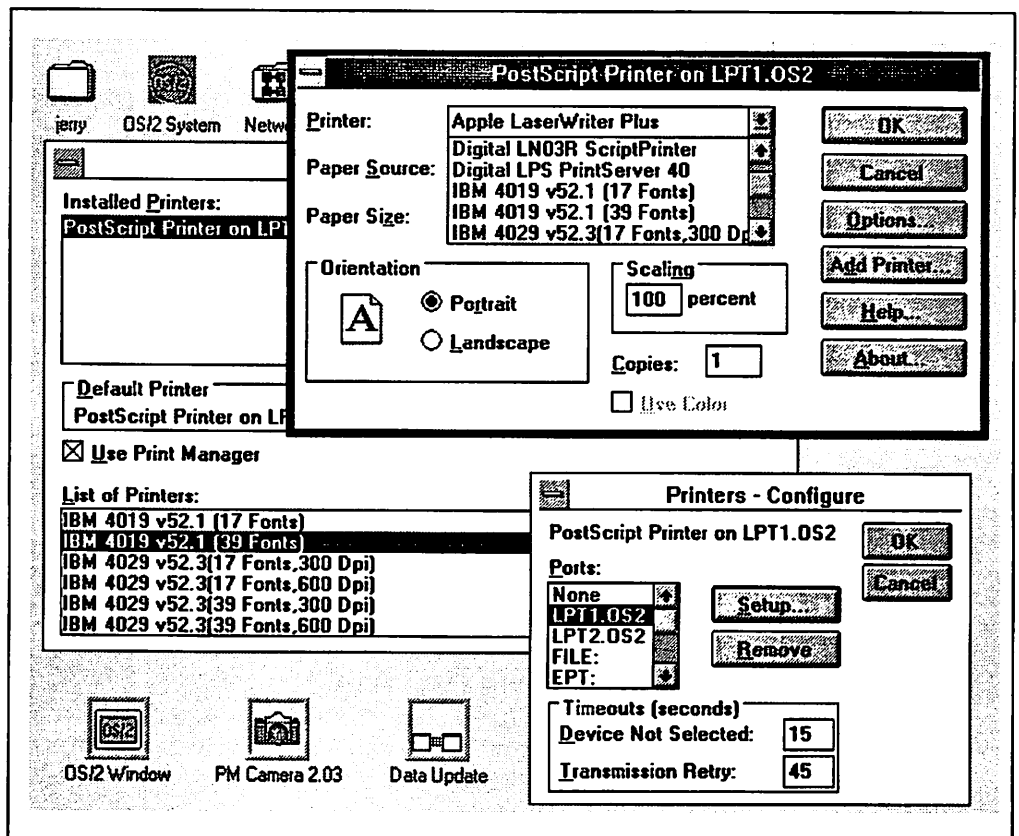


Figure 29. Matching the Printer Name with the Printer Driver Name in WIN-OS/2

### 2.8.1.6 Changing Printer Settings

For most printers you install, you can set options such as page orientation, paper size and graphics resolution. The options available will vary from printer driver to printer driver.

To select printer settings:

1. Double click on the **Printers** icon in the **Control Panel** window of the **WIN-OS/2 Program Manager**
2. Click on the printer in the **Installed Printers** list
3. Click on **Configure**
4. Click on **Setup**
5. Change the desired setup parameters
6. Click on **OK**
7. Click on **OK**
8. Click on **OK**.

### 2.8.1.7 Choosing Timeout Options

You can use the timeout options to adjust the amount of time WIN-OS/2 waits before sending you a message about printer problems. The default values already set should work fine for most situations. One exception to this rule is for PostScript printing. Because PostScript files are larger and more complex they are likely to trip the timeout before printing begins. In this scenario, try setting the timeout to several minutes and then extend it by a minute at a time until you no longer get timeout messages.

To set your timeout options:

1. Double click on the **Printers** icon in the **Control Panel** window of the **WIN-OS/2 Program Manager**
2. Click on the printer from the **Installed Printers** list
3. Click on **Configure**
4. Set the timeout options you want in the **Timeouts** box
5. Click on **OK**
6. Click on **OK**.

### 2.8.1.8 Removing Printers

To remove an installed printer:

1. Double click on the **Printers** icon in the **Control Panel** window of the **WIN-OS/2 Program Manager**
2. Click on the printer from the **Installed Printers** list
3. Click on **Configure**
4. Click on **Remove**
5. Click on **Yes** to confirm removal
6. Click on **OK**.

Removing the printer deletes the printer driver from the system only if no other printer is using that printer driver. Removing the printer driver does not remove any associated fonts.

### 2.8.1.9 Configuring COM Ports

Sometimes it may be necessary to change the settings of a serial port to use a particular device that uses settings that differ from the default values.

To change serial port settings:

1. Double click on the **Ports** icon in the **Control Panel** window
2. Click on a **COM** port
3. Click on **Settings**

Note: You can combine steps 2 and 3 by double clicking on the **COM** port.

4. Set the appropriate options to match the requirements for the physical device connected to the COM port. These should be detailed in the manual for the device
5. Click on **OK**.

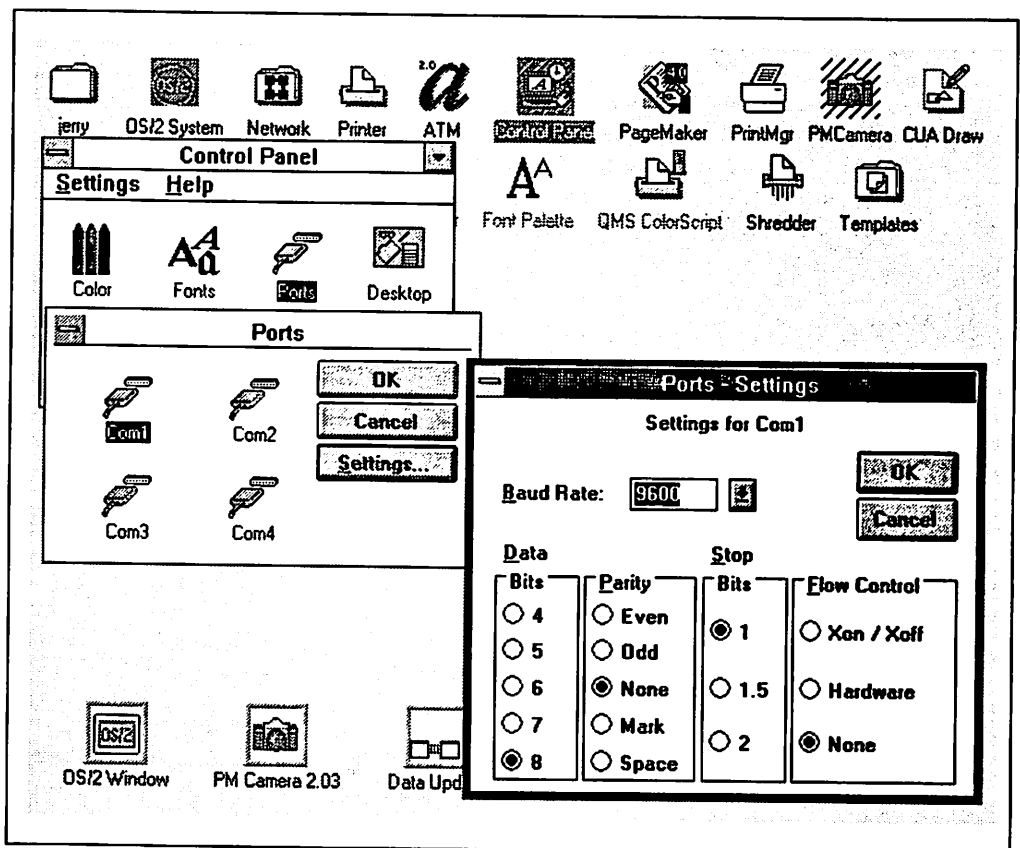


Figure 30. Configuring COM Ports for WIN-OS/2

#### Note

If you are using a COM port with a printer from both OS/2 and WIN-OS/2 then you must set the COM port configuration in the WIN-OS/2 Control Panel under Ports to the same settings as the Serial Port Settings in the OS/2 printer object.

## 2.8.2 WIN-OS/2 Print Manager

OS/2 V2.0 allows you to overcome some of the architectural limitations of Print Manager. To get the advantages, such as, multithreading and dealing with huge print files, of the OS/2 V2.0 print subsystem even while working in WIN-OS/2, leave the OS/2 V2.0 spooler *enabled*. The OS/2 spooler is enabled by default during system installation. If you do this, then print-jobs sent from any WIN-OS/2 application to a *parallel* attached printer won't show up in the WIN-OS/2 Print Manager! In this case if you need to view or manipulate these print-jobs go to the OS/2 printer object on the Workplace Shell, which corresponds to the printer driver and output port of the printer you selected in WIN-OS/2, and double click on it. For more information on how to manage these print-jobs see 2.5, "OS/2 Job Object" on page 35.

However, if you don't print from printer objects in the OS/2 V2.0 Workplace Shell or OS/2 applications, and want to be able to manage all of your WIN-OS/2 print-jobs in your WIN-OS/2 Print Manager then disable the OS/2 spooler. To disable the OS/2 spooler refer to 2.7, "OS/2 Spooler Object" on page 40.

For more technical information about the data flow through the OS/2 V2.0 print subsystem see Chapter 8, "Print Subsystem Data Flow" on page 173.

### Note

The instructions in this section apply to *all* serial (COMx) directed print-jobs. They apply to parallel (LPTx) directed print-jobs only if you have disabled the OS/2 spooler.

The WIN-OS/2 Print Manager window displays the current status of all active print queues. Print jobs are listed below the appropriate printer until they have been printed completely. The status of each print queue is displayed on the printer information line. The status of each print job is displayed on the job information line beneath each printer information line.

### 2.8.2.1 Viewing the Print Queue

To look at the print queue double click on the Print Manager icon which is initially installed in the Main Group of the WIN-OS/2 Program Manager on the WIN-OS/2 desktop.

### 2.8.2.2 Changing the Print Speed

There are three priority levels that can be chosen from WIN-OS/2 Print Manager: low, medium and high. These settings influence the performance of other applications while printing. For example, if you choose High, this will print the jobs faster, but cause other applications to run slower.

To change the print speed:

1. Select **Options**
2. Select **Low**, **Medium** or **High**, as appropriate.



### 2.8.2.3 Changing the Order of Jobs in the Queue

In local print queues you can change the position of a job that has not started printing.

To change the position of a file using the mouse:

1. Drag the file up or down the print queue
2. Release the mouse button to reposition the job in the queue.

Or, alternatively using the keyboard:

1. Click on the file
2. Hold down the Ctrl key and press the Up Arrow or Down Arrow key to move the file
3. Release the Ctrl key.

### 2.8.2.4 Viewing the Time/Date Sent and File Size

The job information line under each printer information line will, by default display the time and date the file was sent and the size of the file. To turn the time and date or file size display off or back on:

1. Click on **View**
2. Click on **Time/Date Sent** or **Print File Size**.

### 2.8.2.5 Print Manager Messages

To display options for WIN-OS/2 Print Manager messages, select one of the following options from the Options menu:

#### 1. Alert Always

This displays messages immediately.

#### 2. Flash If Inactive

This reports incoming messages if the WIN-OS/2 Print Manager window is inactive. Your computer beeps and the WIN-OS/2 Print Manager icon or title bar flashes. Flashing continues until you make the WIN-OS/2 Print Manager window active or restore the Print Manager icon to a window.

#### 3. Ignore If Inactive

This ignores incoming messages if the WIN-OS/2 Print Manager window is inactive or minimized. To see the messages, you must make the WIN-OS/2 Print Manager window active and/or restore the WIN-OS/2 Print Manager icon to a window.

### 2.8.2.6 Pausing and Resuming Printing

This option provides the same function as Hold and Release in the Workplace Shell printer objects with one exception. In WIN-OS/2 Print Manager you can only Pause and Resume the entire queue and not individual print jobs. To pause (hold) a queue:

1. Click on the information line for a queue
2. Click on **Pause**.

The selected information line changes to indicate that printing on this particular print queue has been paused.

To resume (release) a queue:

1. Click on the information line for a queue
2. Click on **Resume**.

The selected information line changes to indicate that printing on this particular print queue has been resumed.

### 2.8.2.7 Deleting a Single Job from a Print Queue

To delete a single job from a print queue:

1. Click on the information line for the print-job
2. Click on **Delete**
3. Click on **OK** to confirm cancellation.

#### Note

If you cancel the printing of a file that is printing in graphics mode, you may have to reset the printer by turning it off and then on again.

### 2.8.2.8 Deleting All Jobs from All Print Queues

You can only delete all the pending jobs in all the print queues by exiting (closing) the WIN-OS/2 Print Manager. To do this:

1. Click on **Options**
2. Click on **Exit**
3. Click on **OK** to confirm the deletion.

### 2.8.2.9 Disabling Print Manager

Disabling Print Manager in WIN-OS/2 has the same effect that disabling the spooler in OS/2 PM has. Remember, however, that this only affects jobs that go through the WIN-OS/2 Print Manager. If the OS/2 spooler is enabled then this will only affect jobs that are sent to serial printers.

To disable Print Manager:

1. Double click on the **Control Panel**
2. Double click on the **Printers** icon
3. Remove the check in the **Print Manager** check box by clicking on it
4. Click on **OK**.

To re-enable Print Manager follow the same steps. This time the check should re-appear.

---

## 2.9 Summary

In OS/2 V2.0 the Workplace Shell offers you wide flexibility to manage all your printer objects, printer driver objects, port objects, job objects, queue driver objects and the spooler object from a central point. Regardless of whether you're printing from the WIN-OS/2 environment, the DOS environment or the OS/2 V2.0 environment, you get the possibility to handle the administrative tasks for *most* print jobs from a single point which is the printer objects on the Workplace Shell.

We recommend that you always keep the WIN-OS/2 and the OS/2 V2.0 print environments in synch regarding installed printer drivers assigned to particular ports and setting the default active printer as well as printer properties.

We also recommend that you always keep the OS/2 spooler enabled to get the most benefit out of the OS/2 V2.0 print subsystem. This configuration will assure that even from the WIN-OS/2 environment printing is done in a separate thread in the OS/2 V2.0 environment.

---

## Chapter 3. LAN Environment

The implementation of the Workplace Shell in OS/2 V2.0 extends beyond the local desktop and into the network environment. The LAN Independent feature of the Workplace Shell provides a seamless link between the desktop and available network resources such as files and printers. The Workplace Shell uses the network printer object to configure and manage network printers. This section will focus on the network printer object as well as how to access the network printers from non-PM environments such as DOS sessions, OS/2 sessions and WIN-OS/2.

---

### 3.1 The LAN Independent Feature of the Workplace Shell

For the purpose of this section we will be describing the LAN Independent feature of the Workplace Shell as it relates to a single domain using IBM LAN Server. If you have access to multiple domains that have network printers defined then be sure to also read section 3.10.3, "Using the Network Folder to Access other Printers" on page 68 for the variations in that environment. The Workplace Shell allows a user to open up the **Network** folder, access a network environment such as **LAN Server** or **NetWare**, display the server(s) within the domain, and then see the files and printers either server by server or in the entire domain. This is shown in the following figure.

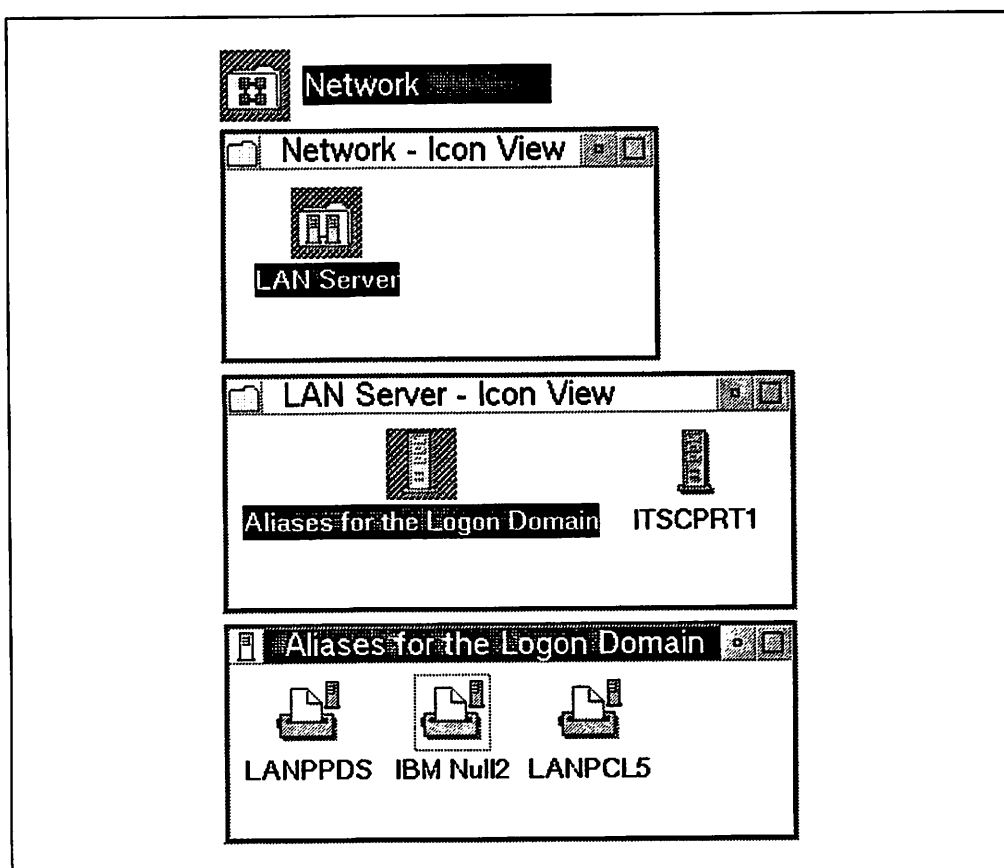


Figure 31. OS/2 V2.0 Access to Network Printers through the Workplace Shell

With respect to printers under IBM LAN Server the **Aliases for the Logon Domain** window, when opened, will display all of the printers that you are *authorized to*

access while the actual server window, when opened, will display all of the printers defined on that server *regardless of authorization*. You will be able to "initialize" all of the printers listed in the server window to the point that they will appear in application printer lists and the default printer selection list on the Workplace Shell. The system will give you no indication which printers you are authorized to use in the server window. It is for this reason that you should access your printers through the **Aliases for the Logon Domain** window.

The following figure shows the difference in the printers displayed between the Logon Domain and the Server windows. Note that we set up the IBMNULL1 printer with no general access. It appears in the Server window but not the Aliases for the Logon Domain window. We were able to initialize it from the Server window but when we sent print jobs to it they effectively "disappeared" without a warning.

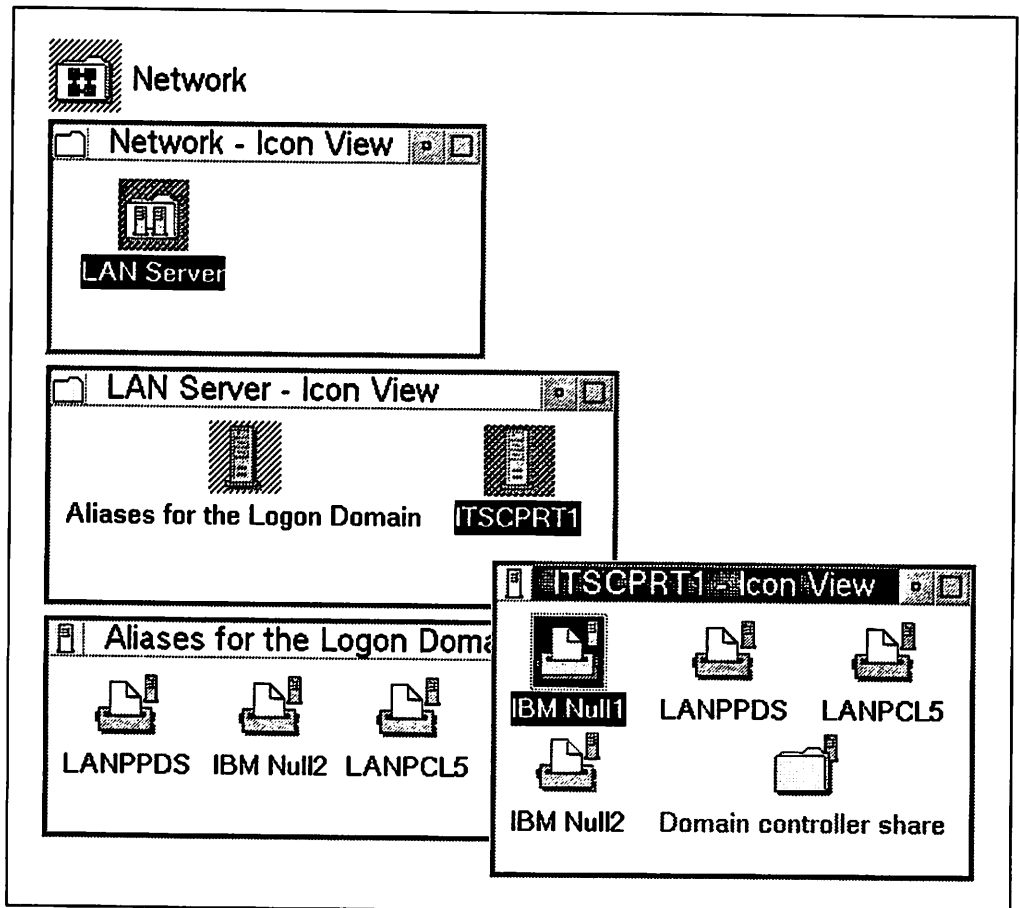


Figure 32. OS/2 V2.0 Logon Domain vs. Server Window Display of Available Printers

## 3.2 Distributing Printer Drivers for Network Users

In order to print from the Workplace Shell or WIN-OS/2 you must have the appropriate printer drivers installed on your system. Network requesters must have the same printer drivers installed that are on the server or the appropriate driver to match the printer on the server. Before we discuss how to install and configure these drivers you must first determine how you are going to distribute them to all of the requesters. If you have a small network then using the printer driver diskettes that come with OS/2 V2.0 to install printer drivers on requester

machines is feasible. However, on larger installations, the logistics of having current printer driver diskettes at every requester can be unmanageable. The obvious answer is to use the network itself to distribute the printer drivers. This distribution can be done in the following ways:

- Copy the printer driver diskettes on a shared network drive
- Download the drivers while using a remote installation program.

### 3.2.1 Copying Printer Driver Diskettes on a Network

Having the printer drivers available from one source to all users ensures that everyone installs the same level of driver that is on the server. If your systems are on a network this is the easiest and fastest way to install printer drivers not only for the network printers, but also for any locally attached printers.

#### **Warning!**

*Do not blindly copy the printer driver diskettes onto a hardfile! There are duplicate file names on different diskettes. For instance, the PostScript drivers for OS/2 and WIN-OS/2 are both named PSCRIPT.DRV. If you were to copy all of the printer driver diskettes into one directory then the OS/2 PSCRIPT.DRV file will be overwritten by the WIN-OS/2 file. In effect, the PostScript driver for OS/2 will disappear!*

There are two methods for copying the drivers:

- The easiest and safest is to create a directory on a shared disk on the server for each printer driver diskette such as PD1, PD2, PD3 and PD4. When you are prompted for a driver simply type in the network drive followed by the appropriate directory. For example you would type in N:\PD1 for the OS/2 PostScript driver. You will find this convenient especially when you install printer drivers in the WIN-OS/2 Control Panel as it will prompt you to insert a diskette #. Instead all you have to do is type in your network drive and PD#.
- You could also separate your printer drivers into two directories, one for OS/2 and one for WIN-OS/2. This is more complex as the OS/2 and WIN-OS/2 drivers are mixed on the diskettes and many drivers have associated files and/or fonts. You can use the PRDRV.LST file on the first printer driver diskette to identify the OS/2 drivers and assume the rest are WIN-OS/2 but this is subject to change. As you can see the first method is by far the simplest and most foolproof.

Remember that as you receive updated or new drivers and install them on the server, be sure to make them available on the network.

### 3.2.2 OS/2 V2.0 Remote Installation Programs

As of the writing of this book there is a new way to install OS/2 V2.0 over a network with configurable options. This includes the ability to create multiple printer objects complete with settings and properties using the Multiple Printer Installation Program which is included in the publication *OS/2 Version 2.0 Remote Installation and Maintenance*, GG24-3780.

---

### 3.3 Network Printer Object Settings

The settings for a network printer object that is accessed by a *normal* user ID are similar to a local printer object with the following exceptions:

- The **View** page adds some network settings
- The **Output** and **General** pages do not exist
- The **Print options** page allows you to view but not change its settings
- You cannot change, install or delete printer drivers or ports
- A new page **Network Status** is listed.

The settings for a network printer object that is accessed by an *administrator* user ID are similar to a local printer object with the following exceptions:

- The **View** page adds some network settings
- The **General** page does not exist
- You can change but cannot install or delete printer drivers or ports
- A new page **Network Status** is listed
- **Remote Admin** is a new option on the network printer object context menu.

Remember that the network printers are actually defined on the server by a local printer object and *all* of the settings are accessible through that object.

### 3.3.1 The View Page

The **View** page of the network printer object settings includes two additional configurable items. These are the **Network Job View** and the **Refresh interval**.

The **Network Job View** allows you to specify what you want to see when you display the queue for the network printer object on your local desktop. You can either see just your pending print jobs or you can choose to see *all* of the pending jobs in the queue. This can be helpful to determine how long it will be for your job to print without having to go to the server. Of course you will only be able to manage your jobs from your user ID.

The **Refresh interval** displays the number of seconds your local system will wait before it “looks” on the server and refreshes your local view of the network queue. It is suggested that you keep this at as high a number as possible as any access to the network will affect the performance of your machine. You always have the option of refreshing at any time by displaying the system menu for the queue and selecting **Refresh**.

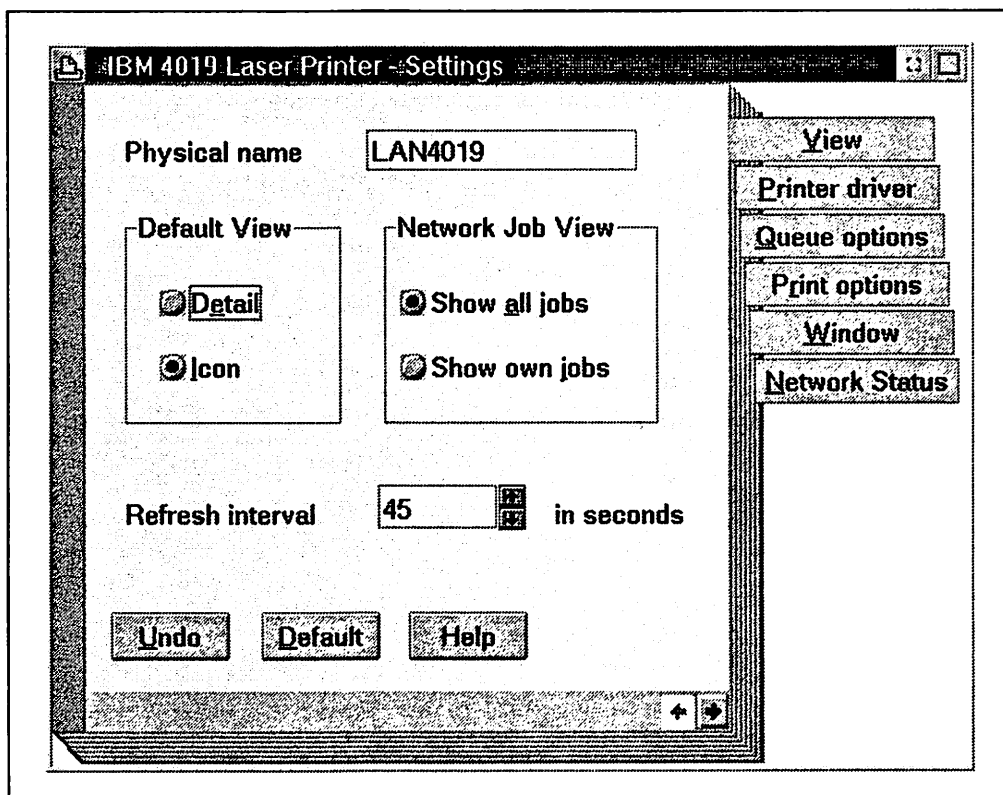


Figure 33. OS/2 V2.0 View Page of a Network Printer Object



### 3.3.2 The Network Status Page

The **Network Status** page contains information about the network printer object as it relates to the server. The names of the **Network**, **Server**, **Resource** (physical name of queue) and **Description** as defined by the administrator on the server are displayed. The **Status** is also displayed as either **Available**, **Unavailable** or **Login required**. Available means that the printer is currently shared. Unavailable means that the printer either is not shared or it may have been removed from the server. Login required means that you must logon to the network to gain access. The **Assigned port** defaults to NONE but it is not necessary to assign a port if you are only printing from the Workplace Shell. If a port is assigned to the resource by using LAN Requester, a NET USE command or using the context menu of a network printer object, then the assigned port will show up in this field. None of the fields displayed on the Network Status page are editable from the Network Status page.

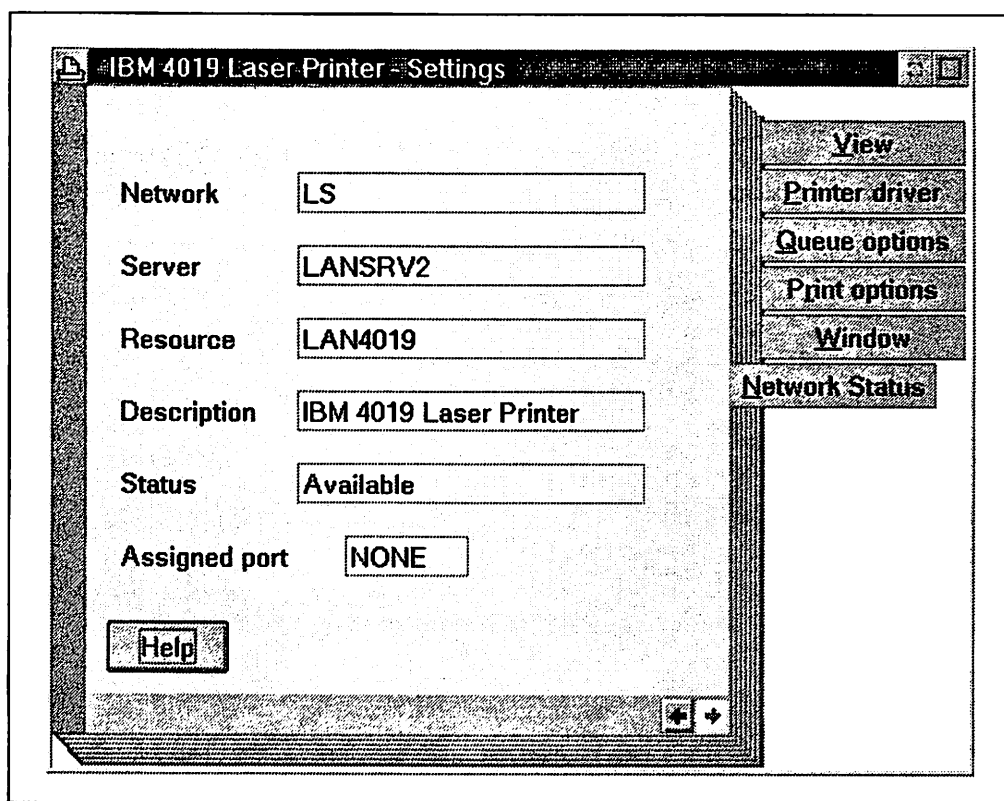


Figure 34. OS/2 V2.0 Network Status Page of a Network Printer Object

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### 3.4 Initializing LAN Shell Network Printer Objects

The network printer object that appears is "aware" of which port the physical printer is attached to, the queue driver that it uses, the printer driver that it uses and all of the settings that were defined by the administrator on the server. Even though you can view the network printer objects, they will not appear in application lists or the default printer list until they are "initialized." This step may require the user to install the same print driver on their requester that is installed on the server if the driver has not been previously installed for a network or local printer object. Initialization will occur if you do one of the following:

- Drag the network printer object to your desktop (or some other location)
- Drag and drop a file to be printed onto the network printer object
- Access the job properties, printer properties or printer driver settings in the network printer object.

In each case a dialog will appear asking you to install a printer driver. To install the requested printer driver do the following:

1. Click on the **Install** button
2. The **Install New Printer Driver** dialog will be displayed
3. Type in the **Directory** path for the driver
4. Scroll and then click on the requested printer driver
5. Click on **Install**.

You will now be able to print to this printer object from your PM applications. You can also drag and drop applicable files on it to be printed. Additionally you will be able to select it as your default printer for the desktop which will enable you to direct jobs such as print screens from the Workplace Shell and windowed sessions.

Of the three methods we recommend that you drag the network printer object to your desktop or another location to initialize it. The reason is that the other methods could put you in a position that you will not be able to delete the printer from application and default printer lists. This is explained in the next section on removing network printers using the Workplace Shell.

The first line in the dialog that requests the printer driver will contain the *exact* name of the printer driver that must be installed. Make sure that this *exactly* matches the printer driver name that you have selected in the Install New Printer Driver dialog. The system will check for this and will do the following:

- If you selected the *exact* matching driver it will be installed and assigned to the network printer object
- If you selected a driver of a different name, but in the same printer driver file, it will install the driver you selected *and* the driver it requested and assign the *requested* driver to the network printer object
- If you selected a driver of a different name from a printer driver file that does not contain the requested driver then no driver(s) will be installed and the network printer object will not be initialized.

If you have multiple printer objects that use the same printer driver then you will only have to install the printer driver once, when you initialize the first object.

You must still initialize the other printer objects in order to use them, but you will not be prompted to install a printer driver.

When using IBM LAN Server make sure that the printer driver *file* that you are installing is the same level and date of the file that is installed on the server.

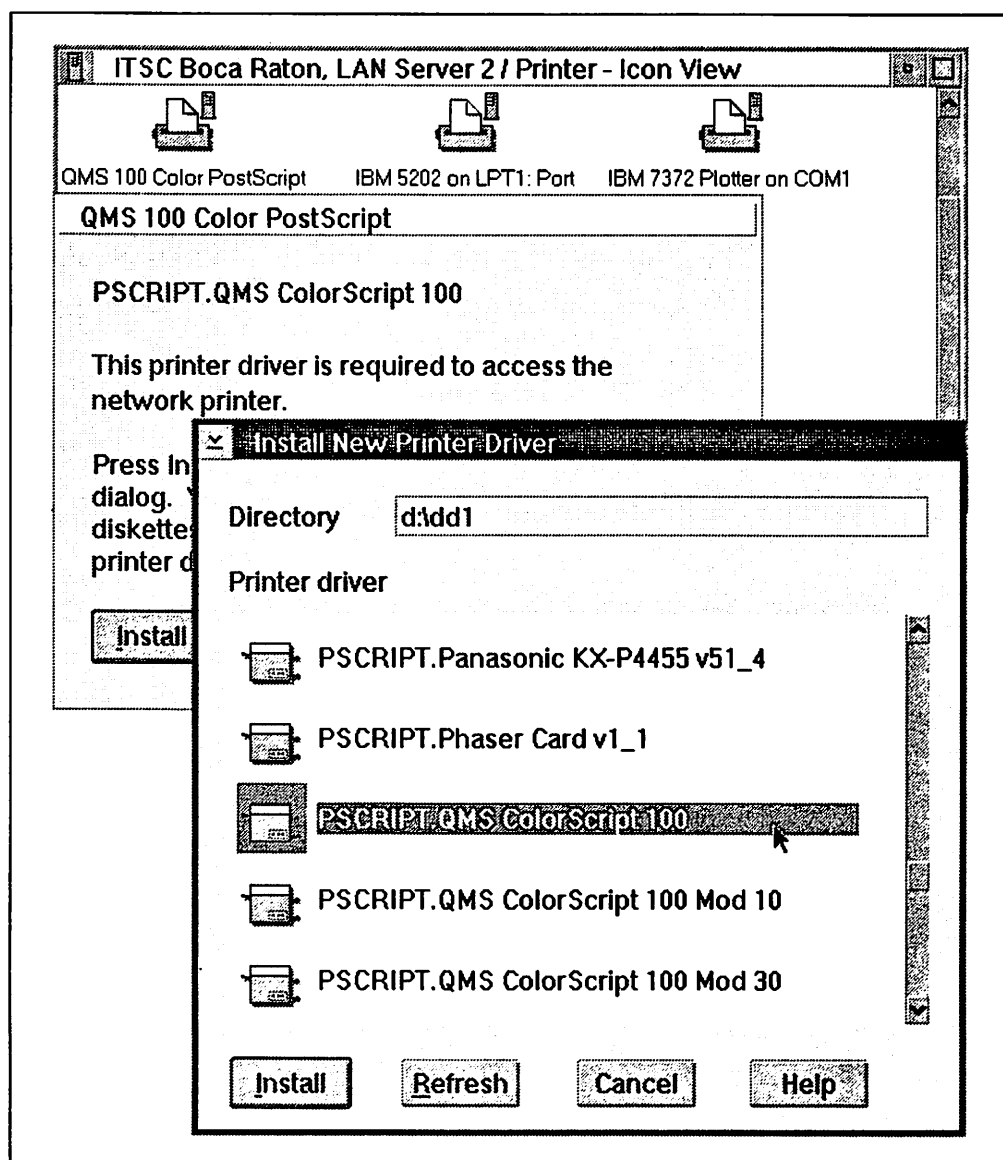


Figure 35. OS/2 V2.0 Initializing Network Printers through the Workplace Shell

### 3.5 Removing Network Printers in the Workplace Shell

As long as you can log on to any domain you will have access to all of the network printer objects no matter how you initialized them. This access will allow you to remove them from application and default printer lists simply by displaying their context menus and clicking on **Delete**. You can do this even to printers that have been removed from the network by the administrator, because entries were made in the \*.INI files of OS/2 for these objects when they were initialized.

The extreme example, and the reason we recommended dragging your network printer objects to another location, is if the machine itself is removed from the network without first deleting the printers from the Network folder. In this case you will not have access to the objects in the Network folder and printers listed in applications and the default printer list will have no objects accessible with which to delete them. These objects in effect become "ghost" printers that will continue to exist until you log on to another network and delete them, rebuild your \*.INI files or reinstall OS/2. With all of your initialized network printers located on your desktop you will be able to remove them regardless of what happens with your network configuration.

---

### 3.6 Using the Network Printer Template

You can use the Network Printer template to define a printer on the network that you want to access. In order to define a printer this way you must be logged onto a network and know the server name and the resource (printer) name. You can then do the following:

1. Double click on the **Template** folder
2. Drag and drop the **Network Printer** template onto your desktop or where you desire
3. The **Access another network printer** dialog will be displayed
4. This dialog has three fields which may or may not contain names:
  - Either directly type in new names, or
  - Click on the button at the right of each field for a list of choices and select from there.

If you click on the button to the right of **Resource** and you are *not* logged onto a network, the network logon dialog will be displayed. You must log on in order to create the network printer object.

5. When the three fields are complete click on **OK**

The system will then check that a valid printer resource has been given. If the printer driver for the resource you specified has not been installed for a previous local or network printer object, you will be prompted to install it at this time. See 3.4, "Initializing LAN Shell Network Printer Objects" on page 61 for directions on how to do this installation.

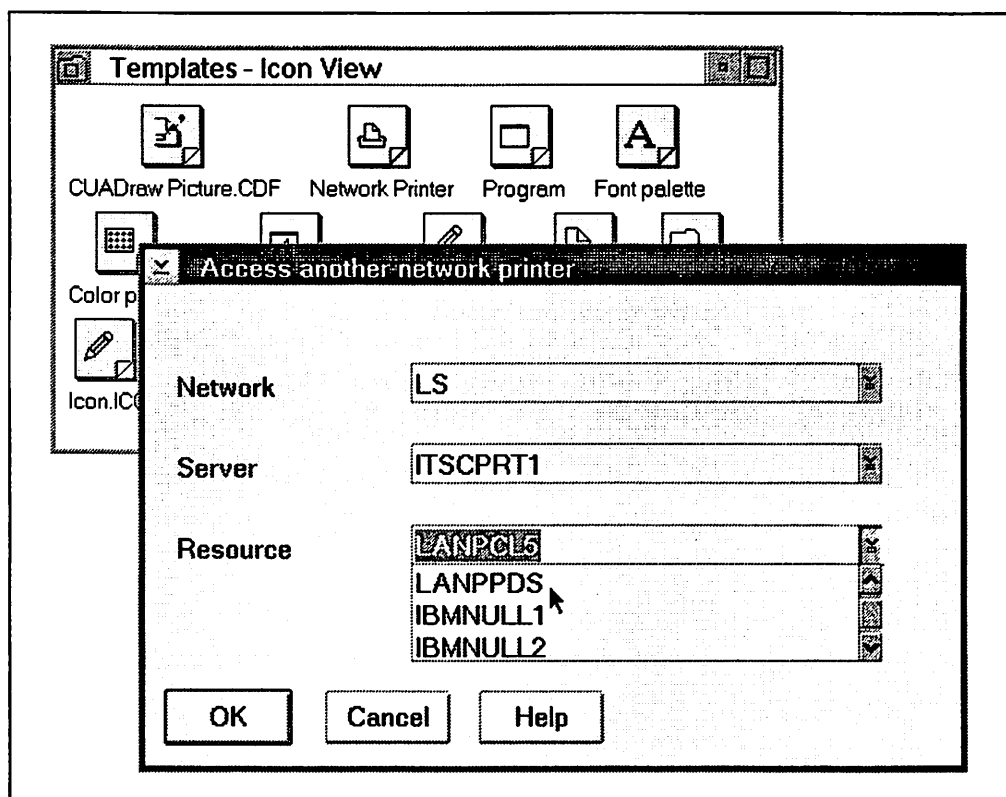


Figure 36. Creating a Network Printer Object from a Template

### 3.7 WIN-OS/2 Considerations

In order to print directly from WIN-OS/2 to network printers an active printer must be defined *with* an LPT port in the WIN-OS/2 Control Panel. This port assignment is the only way WIN-OS/2 can tell the system where to send the print job. With this in mind your network printers must have ports assigned in order for WIN-OS/2 to access them. The next section will describe various ways to do this. Remember that whatever port is assigned in the WIN-OS/2 Control Panel must match the port assignment given to the printer for your system and/or user ID.

The second consideration is that in the default install of OS/2 V2.0 you will only see three LPTx ports and two overlapping LPTx.OS2 ports. This selection may prove inadequate for network use as there may be more than three printers that you want access to from WIN-OS/2. The solution is very simple and is fully described and illustrated in 2.8.1.2, "Assigning a Printer Port" on page 45. Basically all you have to do is edit the WIN.INI file and add a statement for each additional LPT port you want access to.

### 3.8 Assigning Ports

If you only need to print from PM programs, print screens from the Workplace Shell or use drag and drop printing, then you do not need to assign printer ports to network printer objects. If, however, you need to print from WIN-OS/2, DOS and some non-PM applications then you must define a port for each network printer you want to access. If you also plan to print from DOS and OS/2 sessions using the COPY or PRINT commands with an LPTx parameter then you must

define a port for each network printer you want to access. In the case of IBM LAN Server there are three ways to assign ports to network printers:

- With the Workplace Shell
- With the NET USE command
- With the LAN Requester program.

**Note**

Ports assigned using the Workplace Shell or a NET USE command will not normally be saved after you shutdown your system. In order to save these settings you must add the CONNECTIONS option in the SET AUTOSTART line in the CONFIG.SYS file. An example of this is as follows:

```
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,CONNECTIONS
```

### 3.8.1 With the Workplace Shell

Even though you do not need to assign a port if you print from PM applications on the Workplace Shell you can use the Workplace Shell to assign ports for non-PM access to network printers. This method serves the same function as typing in a NET USE command. To assign a port using the Workplace Shell:

1. Display the context menu for the network printer object you want to assign a port to (use mouse button two)
2. Click on **Assign port...**
3. The next available logical port will be displayed
4. Either accept the displayed port or click on the button to the right of the port to display and select a different port
5. Click on **OK**.

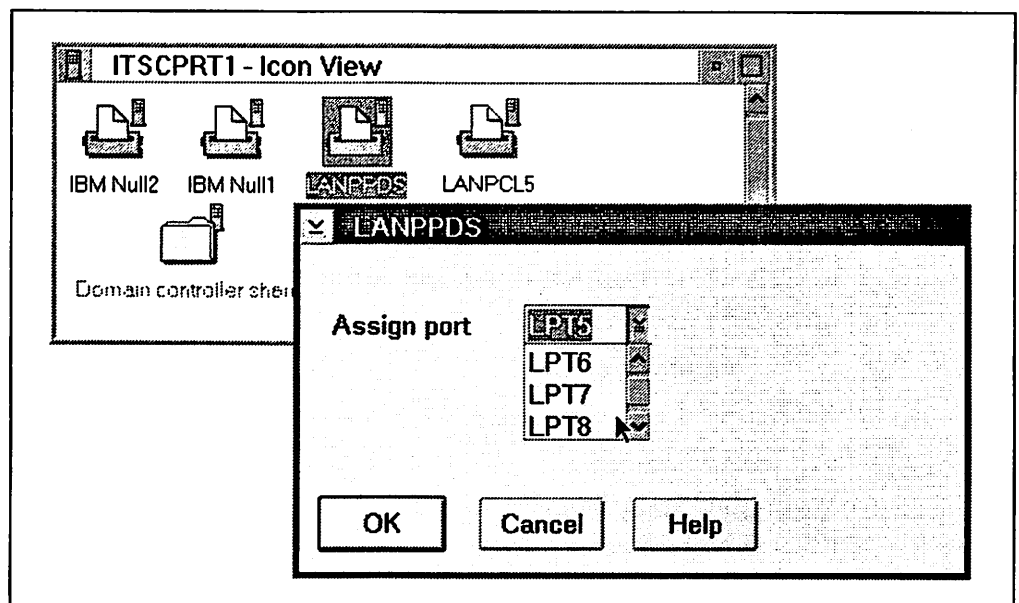


Figure 37. Assigning a Port to a Network Printer Object

### 3.8.2 With NET USE

The NET USE command can be typed in at the command line prompt or it may be imbedded in a batch file and executed from there. The syntax of this statement is:

```
NET USE LPTx \\ServerName\ResourceName
```

To unassign (delete) a network printer from a logical port, type:

```
NET USE LPTx /D
```

For example to access a printer resource named LANPPDS on a server named ITSCPRT1 and assign it to LPT3, type:

```
NET USE LPT3 \\ITSCPRT1\LANPPDS
```

To unassign (delete) the printer, type:

```
NET USE LPT3 /D
```

### 3.8.3 With LAN Requester

Networks require administrative functions such as assigning new users and passwords, describing resources such as files and printers, and then determining who has access to what. LAN Requester is the program that does this for IBM LAN Server. This program can be run by the user as well as the administrator with varying levels of access and control. These assignments will be applied every time the user logs on to that domain. To assign ports using LAN Requester:

1. Double click on the **LAN Programs** group icon on the desktop
2. Double click on the **LAN Requester** program icon
3. Click on **Actions** in the menu bar (or press "A")
4. Click on **Resource assignments...** (or press "R" or the Enter key)
5. Click on **Printers** (or press "P")
6. Click on an **Alias** (or press the Down Arrow to move and the Spacebar to select)
7. Click on **Printer port to be assigned** (or press Down Arrow to move to it)
8. Type in a port or press F4 to get a list of available ports to select from
9. Press Enter
10. Press Enter
11. Repeat the process from step 6 for every printer you wish to assign a port
12. Press Esc
13. Press Esc.

---

## 3.9 Command Line Access of Network Printers

If you have a file that was generated with a "print to file" option in either a printer object, a printer driver or an application then you can use the command line to print it. You can also print plain text files on printers that are capable of handling it. You should be aware that the easiest way to print these files is actually through the Workplace Shell. All you have to do is drag and drop the file icon on top of the printer object. You don't need to know the assigned port or the resource names if you print files through the Workplace Shell. If, however, you still want to use the command line there are two scenarios for output. You can direct output to:

- An assigned port
- A network resource.

### 3.9.1 To an Assigned Port

If there is a port assigned to the network printer you want to print a file to then type:

```
COPY /B FileName LPTx:
```

For example, you have a file named OUTPUT.PRN and you want to print it on LPT7, type:

```
COPY /B OUTPUT.PRN LPT7:
```

### 3.9.2 To a Network Resource

If there is *no* port assigned to a network printer that you want to print a file on you can still print it if you know the name of the resource (printer) and the name of the server it is on. To print a file this way type:

```
COPY /B FileName \\ServerName\ResourceName
```

For example, you have the file OUTPUT.PRN and you want to print it on a printer called LANPPDS on a server called ITSCPRT1, type:

```
COPY /B OUTPUT.PRN \\ITSCPRT1\LANPPDS
```

The /B parameter specifies binary. It may be necessary for certain printer data streams and will not affect ASCII output files. It is therefore a good idea to always specify it.



---

## 3.10 Accessing Printers in Other Domains

There may be a printer that you want to use that is not defined in your domain. This is especially true of high-price, high-quality and high-volume printers. If your domain is physically wired to another domain then you can access printers on that other domain without having to log off your current domain and log on to the other domain. There are two ways to then establish a link to these printers:

- From the Network Printer template or the Access another option in a network printer object context menu
- From the command line prompt.

The following information and conditions must exist:

- The printer must be defined with *general access* to the GUEST user ID.
- If you use the template or the command prompt then you must know the name of the server and the name of the resource (printer).

### 3.10.1 From a Network Printer Object or Access another option

The **Server** name and the **Resource** name used to create a network printer object from the Network Printer template do not have to be in your logon domain. To create a network print object for a printer in another domain:

1. Obtain the server and resource name for the printer you want access to
2. Create a network printer object on the requester with that server and resource name by choosing **Access another** from the context menu of an existing network printer object or follow the steps in 3.6, "Using the Network Printer Template" on page 63
3. The requester will then access that printer through the GUEST user ID without having to log on to the domain.

### 3.10.2 From the Command Line

The **Server** name and the **Resource** name used to access a network printer object from the command line do not have to be in your logon domain. To access a network in another domain using the command line:

1. Obtain the server and resource name for the printer you want access to
2. Type in a COPY command on the requester with that server and resource name by following the steps in 3.9.2, "To a Network Resource" on page 67
3. The requester will then access that printer through the GUEST user ID without having to log on to the domain.

### 3.10.3 Using the Network Folder to Access other Printers

If you have logon access to multiple domains from your requester then you will notice that the Netwrik folder will "collect" the various servers from all of the domains you have ever logged on to and display *all* of them in the Network folder. If you display these servers you will be able to see *all* of the printer resources *regardless* of their access profiles. An example of this is shown in the following figure.

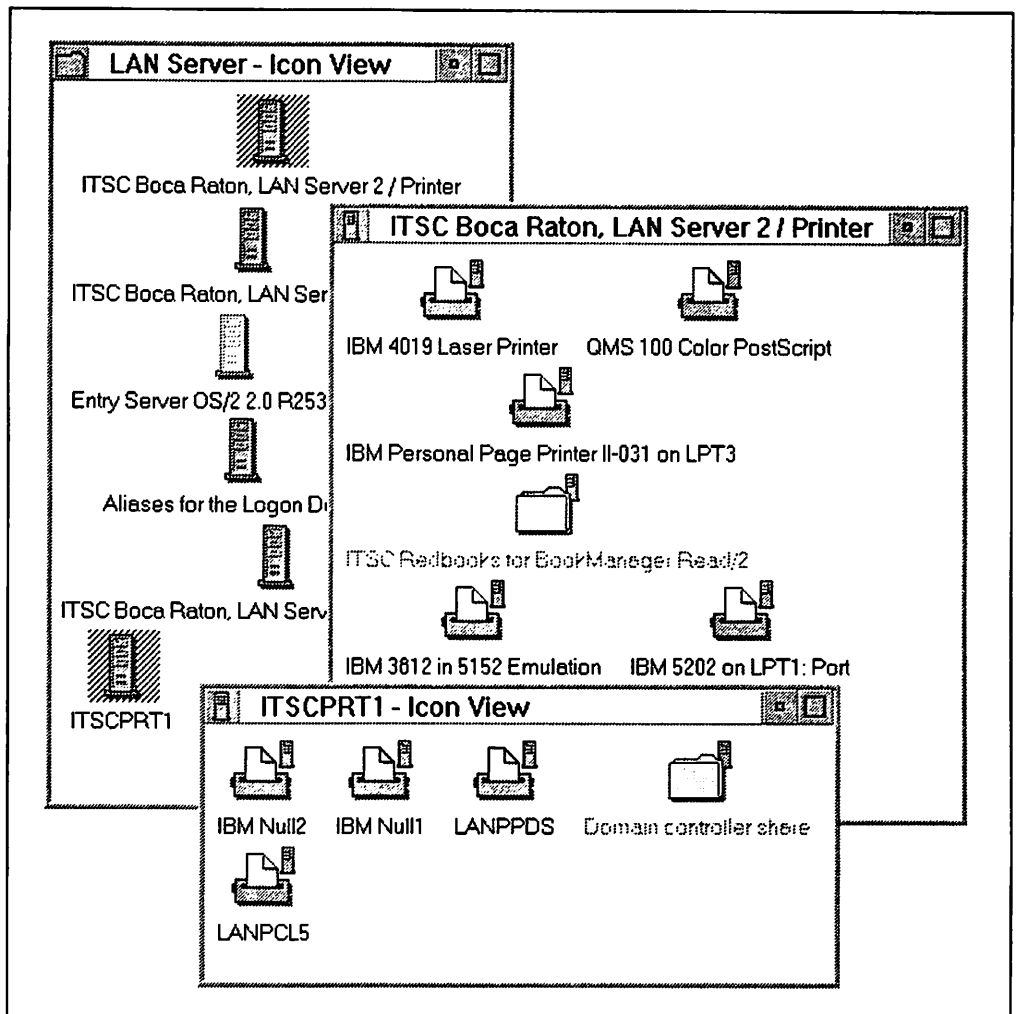
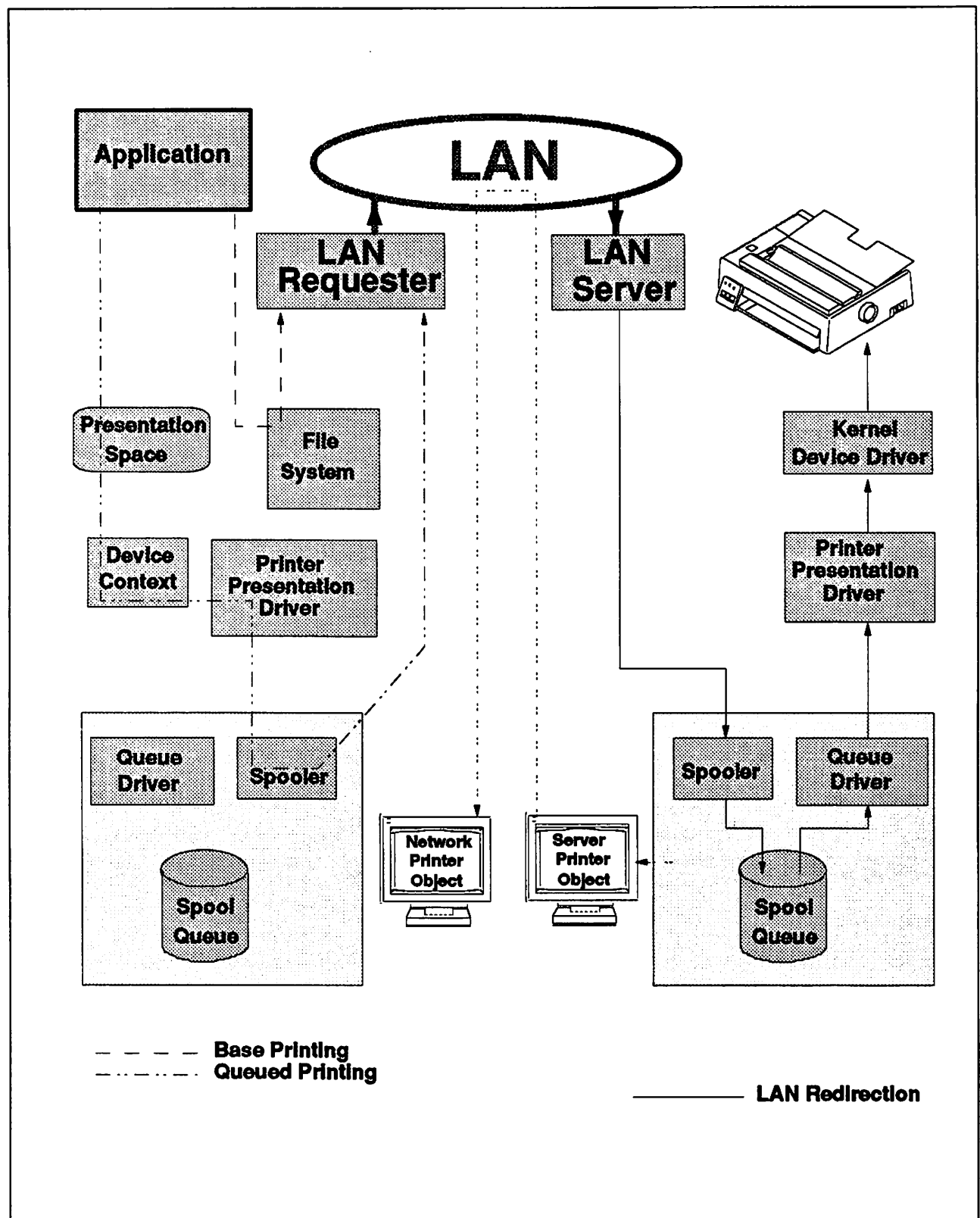


Figure 38. Network Printer Objects in Servers in Multiple Domains

In the single domain scenario we described in 3.1, "The LAN Independent Feature of the Workplace Shell" on page 55 we showed you why you should use the Logon Domain window to display your network printers. In the multiple domain scenario the Logon Domain window will not only show the printers you are authorized to use in the domain you are logged onto, but it will also show the printers that you are authorized to use in other domains that you have previously logged onto. The problem is that resources in this window are accessed by using the name of the logon domain along with the alias. For example if you were to drag and drop a file to be printed on a network printer object in the Logon Domain window that is not in your logon domain you will get the error "Alias not found." This is another strong statement for the practice of initializing any network printer object you want to use by dragging it to your desktop or another location outside of the **Network** folder.

### 3.11 Network Data Flow (LAN Server)



**Figure 39. Overview of the Application Interface and Data Flow for LAN Server**

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## Chapter 4. Fonts

Fonts are used for output by the system to two devices:

- Displays
- Printers.

With the many types of displays and even more numerous types of printers one can imagine the complexity of tracking who can use which fonts and what they look like on a 96 dot per inch display as well as a 300 dot per inch printer.

OS/2 Version 2.0 utilizes the Graphics Engine (GRE) for this purpose. Adobe Type Manager (ATM) is the rasterizer that ships with OS/2 and, through the Intelligent Font Interface (IFI), interfaces with the GRE. There are two ATMs present in OS/2 Version 2.0, one for OS/2 PM applications and the other for WIN-OS/2 applications. These ATMs allow the system to provide a seamless look and consistent output while using *most* applications. Because there are two ATMs with some duplicate files, however, proper installation and management of fonts is critical.

---

### 4.1 Bitmap vs. Outline Fonts

There are two main types of fonts: bitmap and outline. Bitmap fonts were used first because they are easy to define, give excellent quality, and don't need a lot of processing time to be displayed. In the first generation of micro-computers, fonts were hard-wired in the video controller chips and didn't need any CPU processing.

As the graphics screens and printers became cheaper, bitmap fonts became more difficult to handle, because they require a complete set of redefinitions for each size, style (bold, italic, etc.) and device resolution. A new, flexible font technology was needed so outline fonts were chosen.

In outline fonts, each letter shape is defined as a series of graphics orders for a particular typeface. For example, one type of outline fonts are "Type 1" fonts first introduced by Adobe. They are defined on a 1000 x 1000 matrix by a series of straight lines and Bezier curves in PostScript language. This vector outline of curves and lines can then be easily scaled to any size and transforms can be applied such as shearing, perspective and warping.

---

### 4.2 Font Metrics

Font metrics contain characteristics about the font such as height of characters, height of capitals, italic Angle and spacing between characters (kerning pairs). The following figure shows the importance of kerning pairs.

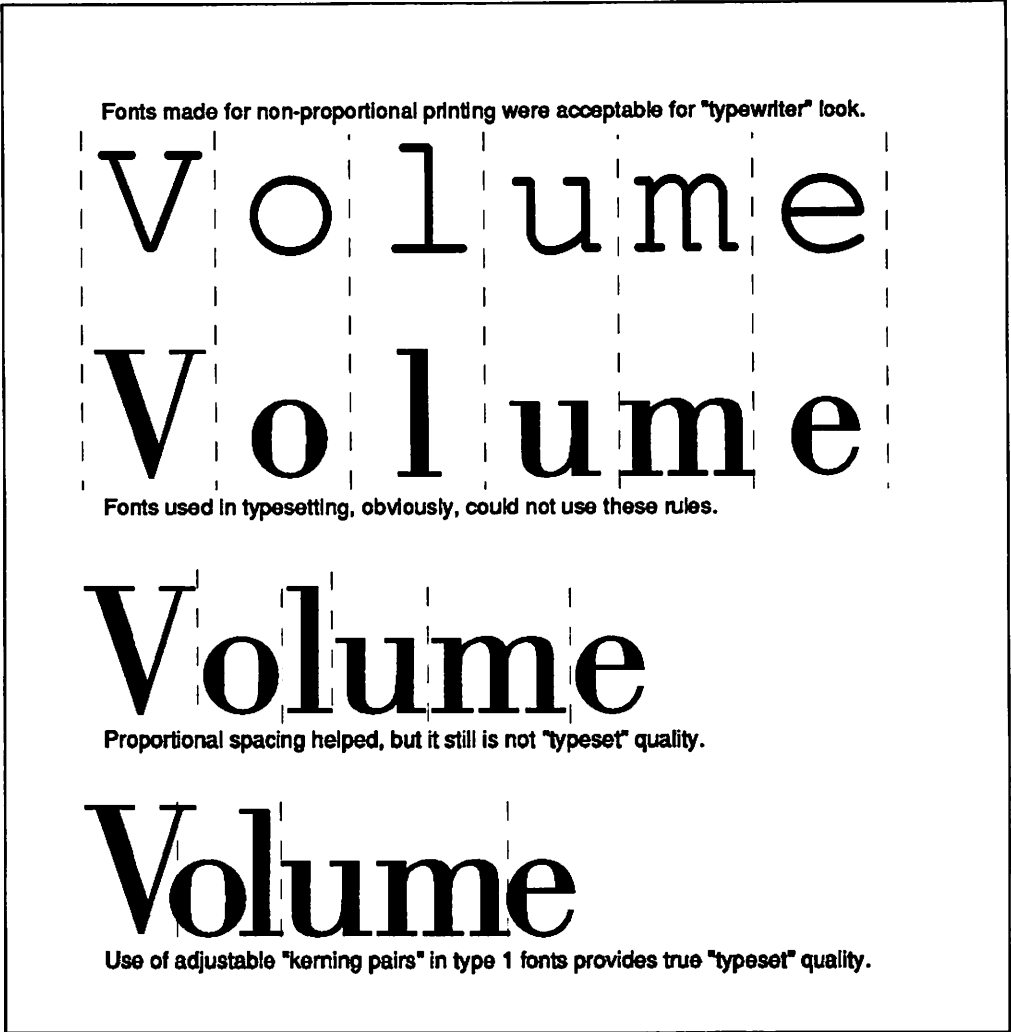


Figure 40. Effect of Kerning Pairs in Type 1 Fonts

The following figure shows a partial list of the 1332 kerning pairs that are in the .AFM file for Berthold Bodoni Antiqua Regular. Note that each entry contains two letters and a number to adjust spacing between those two letters.

StartKernData	KPX A d -20
StartKernPairs 1332	KPX A c -20
KPX A y -62	KPX A Y -82
KPX A w -62	KPX A W -62
KPX A v -62	KPX A V -62
KPX A quoteright -82	KPX A U -20
KPX A quoteleft -82	KPX A T -82
KPX A quotedblright -82	KPX AE y -20
KPX A quotedblleft -82	KPX AE w -20
KPX A q -20	KPX AE v -20
KPX A oe -20	KPX AE hyphen 42
KPX A odieresis -20	KPX AE guillemotright 42
KPX A o -20	KPX AE endash 42
KPX A e -20	KPX AE Z 21

### 4.3 What Makes Type 1 Fonts Different?

To re-size and transform an outline font the system must first scale the outline up or down, then create the corresponding bitmap for each character (all screens and almost all printers are bitmap devices). When you create a character you finally have to choose to put one or two pixels, or to put or not to put a pixel somewhere. This is based on the outline that the font rasterizer scales and it is here that the true shape of the letter is determined. This makes the Type 1 fonts different. Adobe introduced in their fonts "hints" that create these outlines based on typographical standards. For example, when you double the size of the letter "R," the horizontal bar and the vertical bar should not necessarily double in thickness. Nor should they increase in size proportional to one another. Typography needs to be balanced and pleasing to the eye and it is this balance that is contained in the Type 1 hints. These hints become especially apparent at smaller and larger point sizes and are one of the reasons why Type 1 fonts became a de-facto standard.

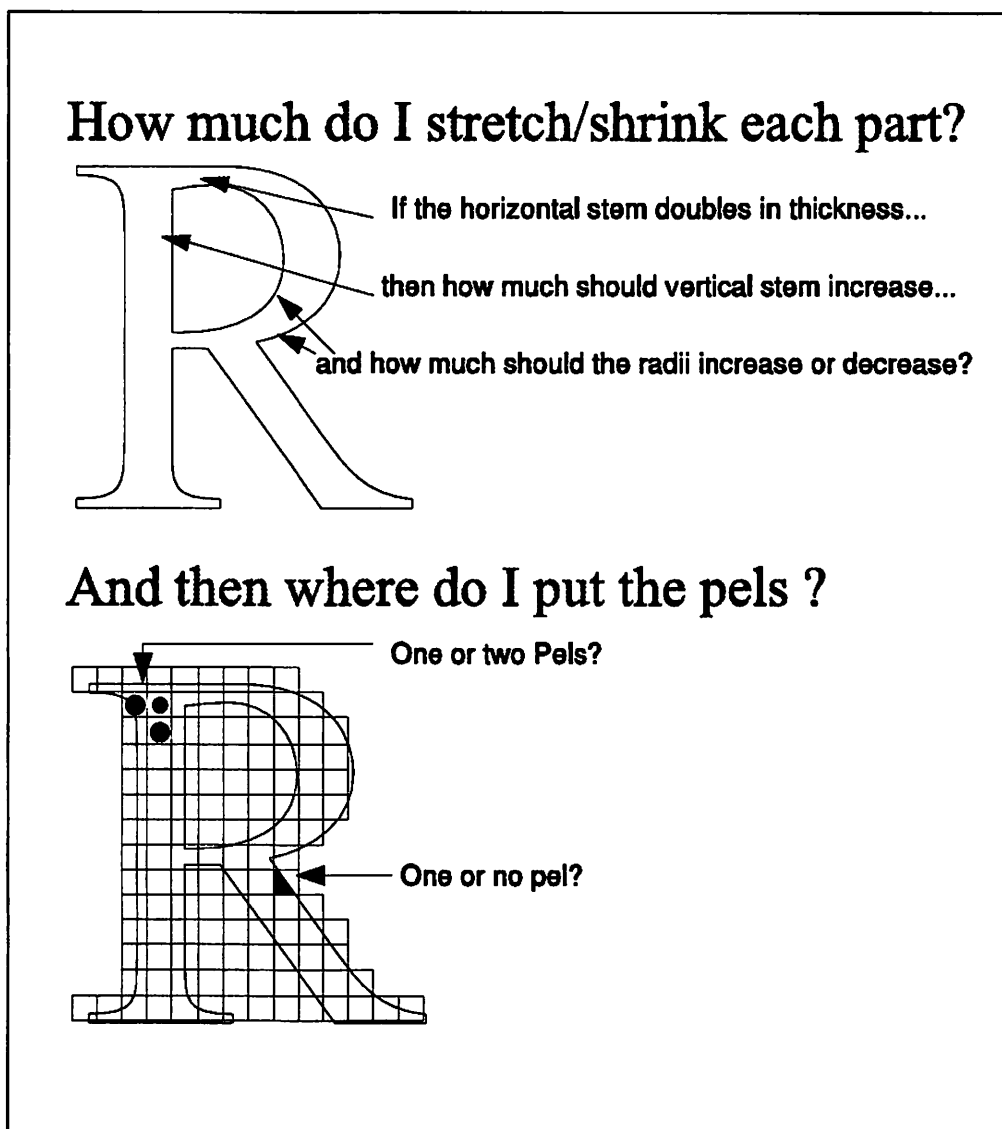


Figure 41. Outline to Bitmap Transformation

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## 4.4 Font File Formats

### 4.4.1 OS/2 V2.0 System Fonts

**Files: .FON**

These files hold the standard OS/2 V2.0 bitmap fonts and are copied there by the OS/2 V2.0 install procedure.

**Files: .PSF**

These files are the Type 1 Font files in internal-to-PM format which are designed (for efficiency) for the core fonts *only* (Times New, Courier and Helvetica).

### 4.4.2 Type 1 Fonts

**Files: .AFM**

These files hold the Adobe Font Metrics and are used by OS/2 PM ATM. Information such as character widths and kerning pairs are in this file.

**Files: .PFB**

These files hold the Printer Font Binary and are used by both OS/2 PM ATM *and* WIN-OS/2 ATM. These are the files that can be downloaded into printer storage.

**Files: .PFM**

These files are used by WIN-OS/2 ATM.

### 4.4.3 PPDS Fonts (IBM 4019 driver)

**Files: .FMF**

Font Metric Files contain the metrics for fonts on cards or fonts that are to be downloaded to the printer. These metrics are used by the printer driver to locate how and where the text gets printed.

**Files: .CDF**

Card Definition File contains the names of all .FMF files required to support all fonts on a removeable font card or cartridge.

**Files: .PMF**

Packed Metric File contains .CDF and .FMF files. These files hold the metric information for fonts on cards and cartridges. The drivers unpack this file to multiple .CDF and .FMF files when the **Initial** button is selected in the **Font Cards** dialog.

**Files: .DLF**

DownLoadable Font files (bitmapped fonts only). The driver copies these files to the printer and uses the associated .FMF file to support a soft font. You can select when .DLF files are to be downloaded, during first print or downloaded only when used in a job.

#### 4.4.4 PostScript Driver

##### Files: .PFA

These files hold the Printer Font ASCII and are embedded by the PostScript device driver into the PostScript print job if you installed them as downloadable fonts.

##### Files: .PFM

These files hold the Printer Font Metrics and used by the PostScript printer driver to download fonts.

---

### 4.5 Adobe Type Manager Overview

ATM, in conjunction with the Intelligent Font Interface of OS/2 V2.0, provides WYSIWYG text to all OS/2 V2.0 PM and WIN-OS/2 supported printers and displays. WYSIWYG (What You See Is What You Get) implies that what you see on the display is what you will see on the printed page. In reality, a 96 dot per inch display *cannot* show you what a 300 dot per inch printer will produce. It is physically impossible. What it will give you is fully formed characters in virtually any size and a sense of the "balance" of the page with respect to line, word and letter spacing. With ATM you have the ability to install and use any of the hundreds of Type 1 Fonts compatible with the PostScript page description language. Thirteen Type 1 fonts are included in OS/2 V2.0 in four font groups (Times New\*\*, Helvetica\*\*, Courier and Symbol). This provides a satisfactory basic working set, to which extra fonts can be added.

With ATM, users now have a wider choice of fonts, and can display and print them even on lower-cost devices. For example, PostScript-quality fonts can now be printed on non-PostScript devices such as the IBM 4019 and 4029, and the HP LaserJet series without the need to add the additional PostScript interpreter option. You still get excellent results, though slower performance, as the fonts will be rasterized in the computer rather than the printer. Even an IBM 4201 or an IBM 5152 or other low-cost matrix printers can print Type 1 fonts but, of course, not with the same quality as laser printers. These same fonts can also be "installed" as downloadable fonts to be sent to PostScript printers for faster print performance.

The list of available fonts for *most* applications is a combination of the the list in the printer device driver you have selected for output and the additional fonts you have installed. Tests with Lotus\*\* 1-2-3/G, Aldus\*\* PageMaker\*\* and DeScribe\*\* indicated that as soon as additional fonts were installed in the Font Palette of OS/2 PM and/or the ATM Control Panel of WIN-OS/2, all of these applications were able to include them in their font choice list, display them and print them. Some applications like CorelDraw!\*\* 2.0 use their own internal outline format for fonts. They will use the same Type 1 fonts as ATM but the fonts must be installed separately in each application. Consult your application documentation to determine how each one handles fonts.



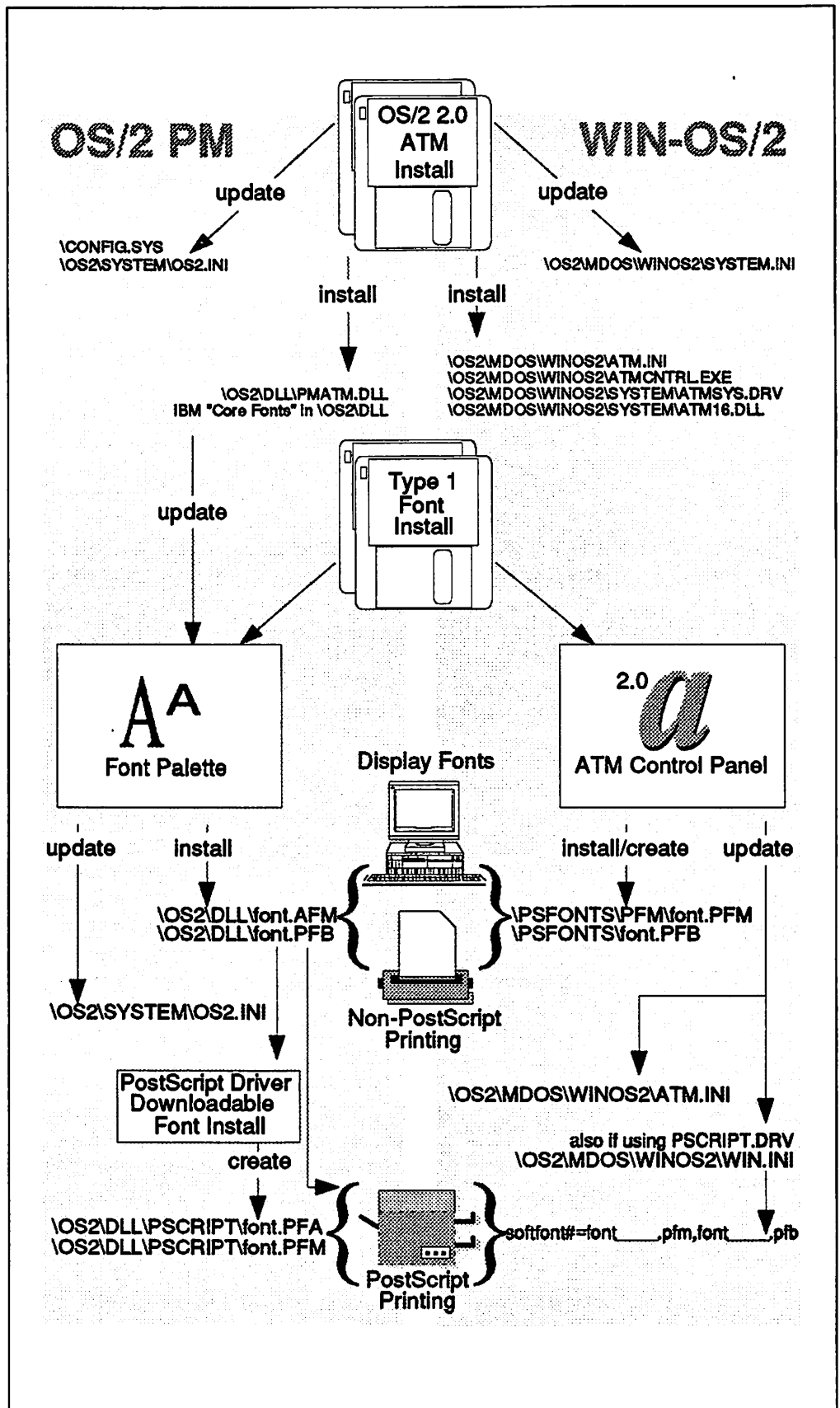


Figure 42. File Structure of Adobe Type Manager

# 4.6 ATM for OS/2 PM

As mentioned before, ATM for OS/2 PM is the font rasterizer that ships with OS/2 V2.0. OS/2 V2.0's Intelligent Font Interface is the interface for such rasterizers, and other font technologies could also write to this interface. ATM for OS/2 PM is accessed by using the **Font Palette** in the **System Setup** folder in the **OS/2 System** folder. If you plan to manage fonts frequently after your initial installation, it is recommended that you copy or shadow the **Font Palette** to your desktop.

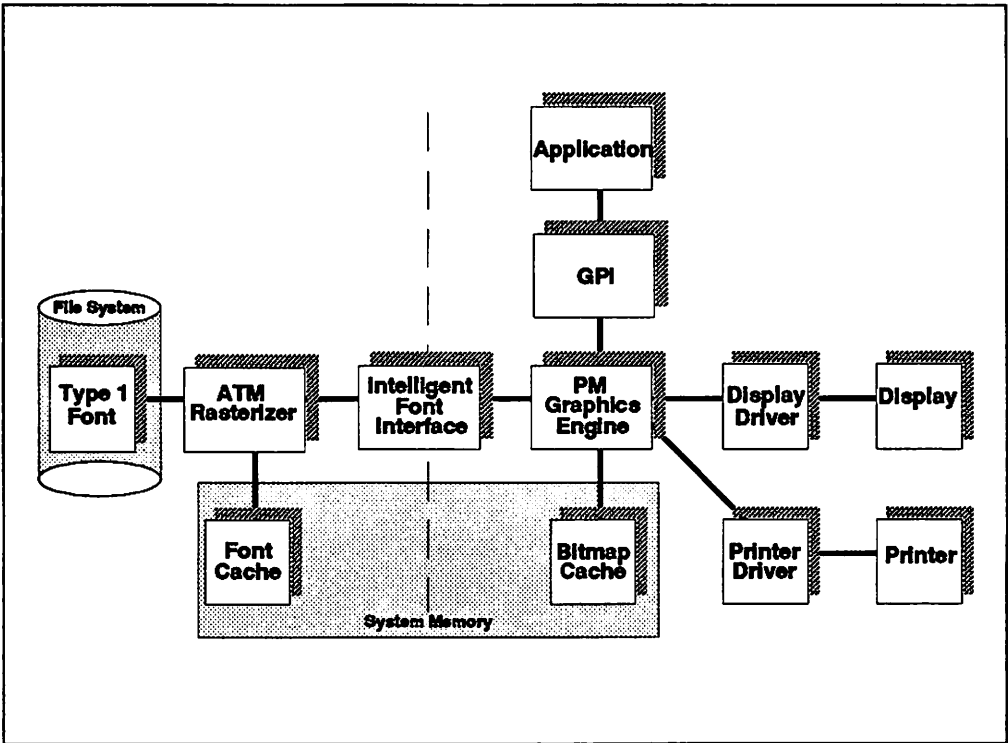


Figure 43. Character Generation Model in OS/2 PM

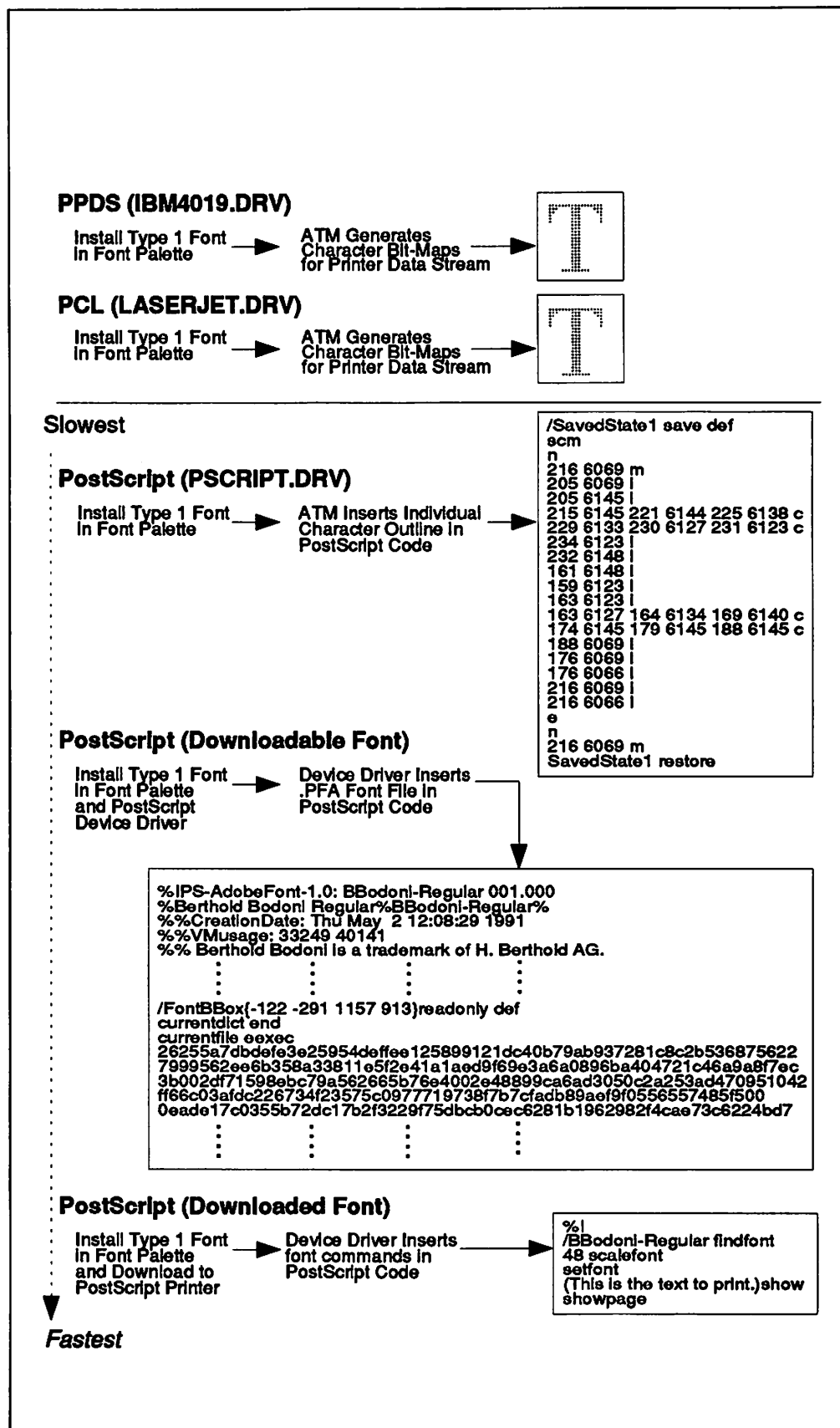


Figure 44. OS/2 PM Use of Type 1 Fonts

### 4.6.1 Installing ATM for OS/2 PM

ATM is automatically installed when you install the OS/2 base code. In addition, the 13 IBM "Core Fonts" are also installed. After installing OS/2 V2.0, the directory \OS2\DLL\ will contain the following font related files.

\OS2\DLL\				
3-19-92	7:19a	77619	0	COURIER.FON
3-19-92	7:21a	206581	0	HELV.FON
3-19-92	7:23a	35391	0	MISC.FON
3-19-92	7:23a	35007	0	SYSMONO.FON
3-19-92	7:23a	198631	0	TIMES.FON
3-19-92	2:55a	205312	0	COURIER.PSF
3-19-92	2:55a	164352	0	HELVETIC.PSF
3-19-92	2:55a	176128	0	TIMESNRM.PSF

The Adobe Type Manager itself is contained in a dynamic link library \OS2\DLL\PMATM.DLL and maintains a font list in \OS2\SYSTEM\OS2.INI. It delivers its function through a hook into the operating system and can also be called by PM for its special services.

### 4.6.2 Installing Additional Fonts for OS/2 PM ATM

Adobe and other vendors supply hundreds of Type 1 fonts. Adobe distributes them in their Adobe Type Library (usually a pack of one or two font families with normal, bold, italic and bold italic variants). These contain fonts which are mainly used for downloading to PostScript printers. To install an additional font:

1. Open the **Font Palette**
2. Click on **Edit font...**
3. Click on **Add...**
4. Insert the diskette or type in the location of the fonts to be added
5. Click on **Add...**
6. Click on the **Font files** you wish to add and their **Font names** will appear.
7. Click on **Add**.

When installation is complete you will be returned to the Edit Font window. You *must* close the Edit Font window then re-open it to access the new fonts.

#### Important

When you install the fonts the system will prompt you with suggested paths for the files. Although you may change the path remember one thing, WIN-OS/2 ATM will also be installing the .PFB files and will place them in a different directory. You will be tempted to use the same directory for both OS/2 PM and WIN-OS/2. We recommend that you use the default settings because when you delete a font with the OS/2 PM Font Palette it will also prompt you to delete the .AFM font file. If you say "Yes" then it will also delete the .PFB file "without warning!" This will make the font unusable, although still installed, in WIN-OS/2. Allowing the system to keep your OS/2 PM and WIN-OS/2 fonts separate will save a lot of confusion in managing fonts.

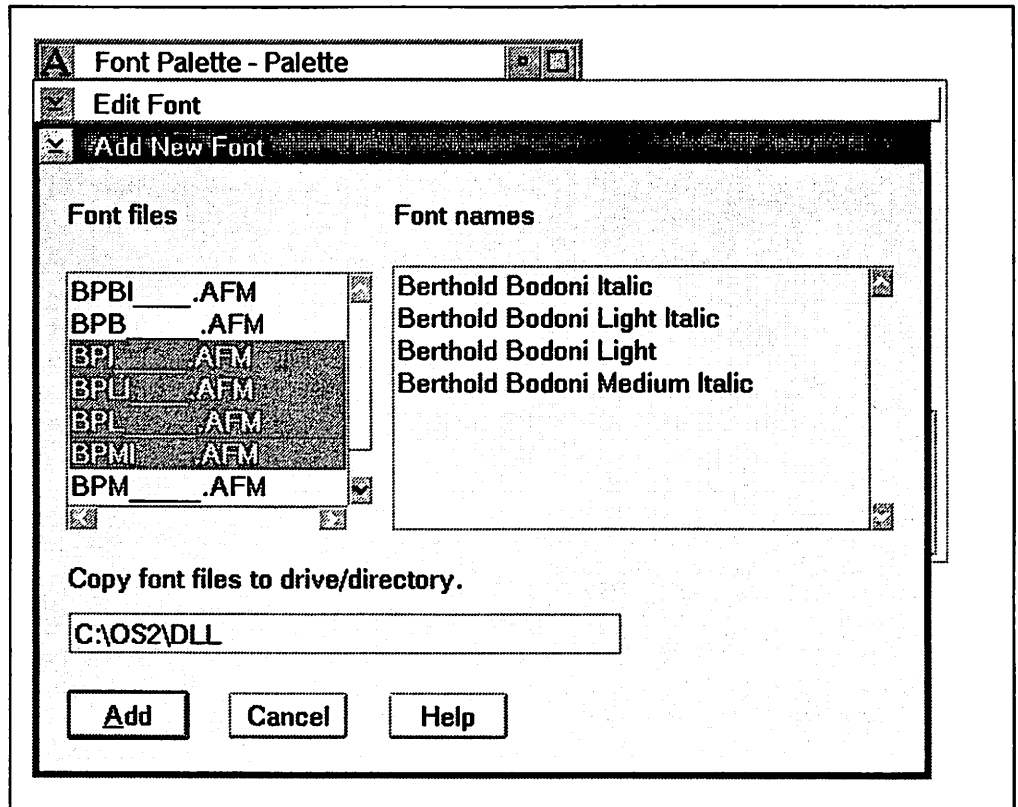


Figure 45. Font Palette: Add New Font Dialog Box

Icon	Title	Size	Last write date	Last write time	Last access date	L
	BPBI_.AFM	37,902	5-1-90	8:00:00 AM	3-28-92	
	BPBI_.PFB	39,648	5-1-90	8:00:00 AM	3-28-92	
	BPB_.AFM	33,466	5-1-90	8:00:00 AM	3-28-92	
	BPB_.PFB	38,664	5-1-90	8:00:00 AM	3-28-92	
	BPI_.AFM	33,903	5-1-90	8:00:00 AM	3-28-92	
	BPI_.PFB	36,930	5-1-90	8:00:00 AM	3-28-92	
	BPLI_.AFM	33,653	5-1-90	8:00:00 AM	3-28-92	
	BPLI_.PFB	37,381	5-1-90	8:00:00 AM	3-28-92	
	BPL_.AFM	32,015	5-1-90	8:00:00 AM	3-28-92	
	BPL_.PFB	35,979	5-1-90	8:00:00 AM	3-28-92	
	BPMI_.AFM	40,850	5-1-90	8:00:00 AM	3-28-92	
	BPMI_.PFB	38,740	5-1-90	8:00:00 AM	3-28-92	
	BPM_.AFM	31,747	5-1-90	8:00:00 AM	3-28-92	
	BPM_.PFB	38,098	5-1-90	8:00:00 AM	3-28-92	
	BPRG_.AFM	33,643	5-1-90	8:00:00 AM	3-28-92	
	BPRG_.PFB	35,837	5-1-90	8:00:00 AM	3-30-92	

Figure 46. These Files Were Added to the \OS2\DLL Folder after Installing

**Note:** The file format is different than the format of the standard core fonts delivered with OS/2 V2.0. The core fonts have been modified for performance reasons, where these fonts are installed as standard Type 1 fonts.

#### Important

Because information is changed in the OS2.INI file, don't try to install or remove fonts just by copying or erasing files. Adding or deleting fonts must be done with the Font Palette and the printer device drivers.

The core fonts delivered with OS/2 V2.0 PM are loaded in a different format. **Don't** install them with the Font Palette; you must use the OS/2 V2.0 installation diskettes.

For faster performance and better typeset quality don't forget to either install these fonts as downloadable, or download them directly, if you are using them with a PostScript printer, which does not have them already built-in. These processes are covered in 4.8.3, "Downloaded Printer Fonts" on page 88 and 4.8.4, "Downloadable Printer Fonts" on page 88.

The theory of OS/2 V2.0's support of the ATM is that these fonts should be installable via the Font Palette in the usual way. They are except for a small problem. OS/2 V2.0's Font Palette looks for two files at installation time, one with an .AFM extension, and another with a .PFB extension. Adobe used to ship these files on two separate diskettes in the Adobe Type Library package. If you put the "Screen Font And Metrics Diskette" (the one with the .AFM file(s)), you get a list of files (usually at least three or four per diskette) with the family font name alongside each, and can then select one or more to install. It copies the .AFM file okay, but then displays an error message saying it can't find the corresponding .PFB file. The "advice" which accompanies the message says that you are out of space on the drive, or that the drive is not ready. Neither is true, ATM just can't find the .PFB file in the drive because it is on the the diskette labelled "Printer Font Diskette," but it doesn't give you a chance to put that disk in and retry. The way around this problem is to copy the relevant .AFM and .PFB files to a separate directory (for example C:\FONTS) and install using C:\FONTS as the source directory. This works fine and allows you to install several fonts in one step. It is also much faster than installing from the diskette and you can use this same directory as the source for installing these fonts for WIN-OS/2 as well as applications such as CorelDraw! and Designer. Once installed, the additional Type 1 fonts are used by the applications and added to the font menus. They are then treated in the same way as Times New or Helvetica, and are available in the same variety of point sizes.

#### Information

Adobe has changed the packaging of their Adobe Type 1 Library to include the required .AFM and .PFB files on the same disk. Regardless of the source of your fonts the .AFM and .PFB font files *must* be on the same diskette or in the same directory in order to install correctly.

### 4.6.3 Deleting Fonts for OS/2 PM ATM

The standard core fonts and the additional Type 1 fonts have to be deleted with the Font Palette. To delete them:

1. Open the **Font Palette**
2. Click on **Edit font...**
3. Click on **Delete...**
4. Click on the **Font files** you wish to delete and their **Font names** will appear
5. Click on **Delete**
6. You will get two confirmation windows
7. Clicking on **Yes** in the first confirmation window will remove the font from the palette but not the files as it suggests
8. Clicking on **Yes** in the second confirmation window will delete the corresponding .AFM and .PFB font files.

When the font is deleted you will be returned to the Edit Font window. If you clicked on **Yes** in *both* confirmation windows then you *must* close the Edit Font window then re-open it to see the updated font list. If you clicked on **Yes** in the first confirmation window and **No** in the second then you *may* have to shut down your system and restart it to see the updated font list.

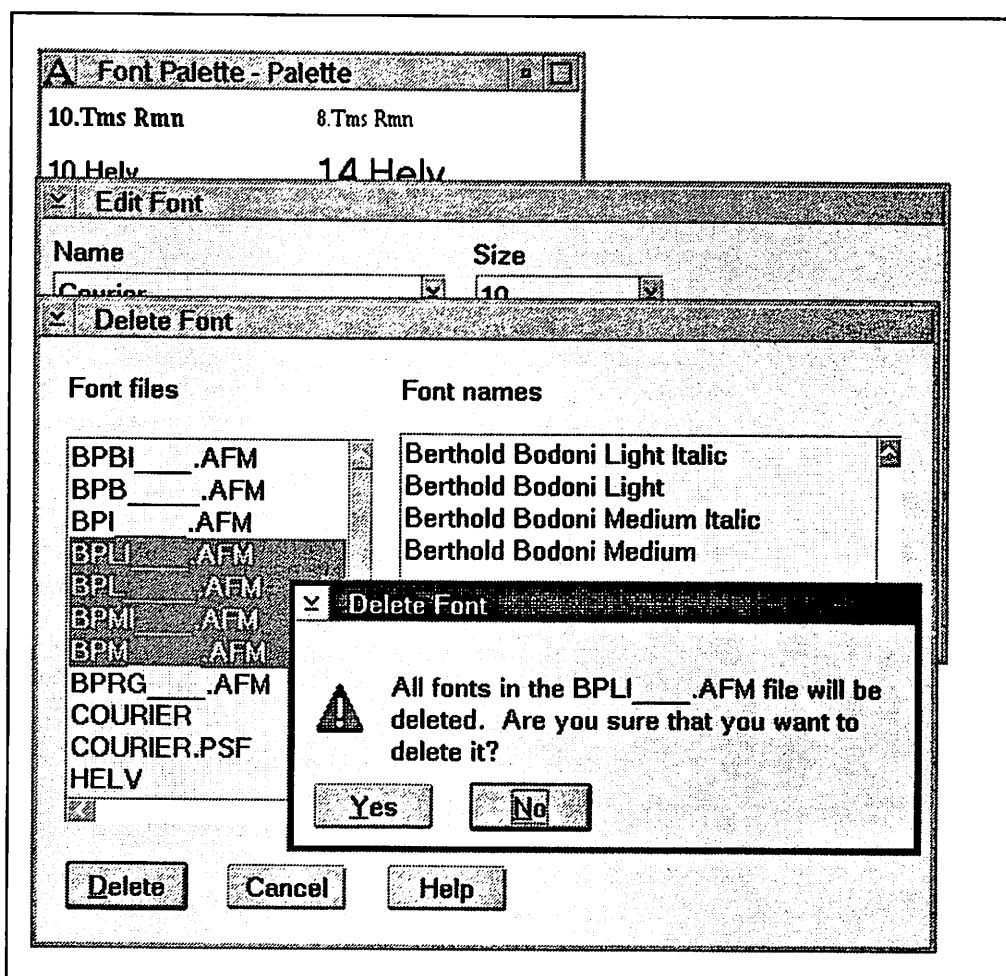


Figure 47. Font Palette: Delete Font Dialog Box (First Confirmation Window)

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## 4.7 ATM for WIN-OS/2

While ATM for OS/2 PM is integrated into the operating system, ATM for WIN-OS/2 is a separate program that is automatically installed into the WIN-OS/2 desktop. ATM for WIN-OS/2 is accessed by using the ATM Control Panel in the WIN-OS/2 Main group. If you plan to manage fonts frequently after your initial installation it is recommended that you create a program icon on your OS/2 PM desktop for the WIN-OS/2 ATM control panel. The next section will describe how to do this.

### 4.7.1 Installing ATM for WIN-OS/2

ATM for WIN-OS/2 is automatically installed when you install the OS/2 base code. However, the 13 IBM "Core Fonts" that are automatically installed for you in OS/2 PM are not installed under WIN-OS/2. In fact ATM for WIN-OS/2 is itself not active until you install at least one font. This is why you will see an "X" over the ATM icon when you start a WIN-OS/2 Full Screen session if you have not installed any fonts. Included on the device drivers diskettes are the necessary font files to install these IBM "Core Fonts" for WIN-OS/2. They are currently located on printer driver diskette #5.

As mentioned previously, it is a good idea to have the WIN-OS/2 ATM icon on your OS/2 PM desktop if you manage fonts frequently. There are two ways to do this:

1. You can use the Migrate Applications program in the System Setup folder. However this will place the icon in a folder called "Additional Windows Programs." You will then have to open that folder and drag-and-drop the ATM Control Panel icon onto your desktop.
2. You can also open the Templates folder and drag-and-drop the Program icon on your desktop and type in the prompts. ATM for WIN-OS/2 is located in \OS2\MDOS\WINOS2\ATMCNTRL.EXE. Use \OS2\MDOS\WINOS2 as your working directory. Under Session select WIN-OS/2 window if available; otherwise, select WIN-OS/2 full screen.

### 4.7.2 Disabling ATM for WIN-OS/2

Under certain conditions ATM may become disabled or you may want to remove it for performance reasons if you only use standard fonts. In either case ATM for WIN-OS/2 is activated based on entries in the SYSTEM.INI file located in the path \OS2\MDOS\WINOS2. If installed correctly you will see the following statements:

1. `system.drv=atmsys.drv`
2. `atm.system.drv=system.drv`

To disable ATM:

1. Delete the `atm.system.drv=system.drv` statement
2. Change `system.drv=atmsysdrv` to `system.drv=system.drv`



### 4.7.3 Installing Additional Fonts for WIN-OS/2 ATM

Before installing *any* additional fonts for WIN-OS/2 make sure that *all* of your printers are installed and that they are configured for the correct output port. WIN-OS/2 maintains its font information in the ATM.INI for non-PostScript printers and in the WIN.INI for PostScript printers. For PostScript printers this means that PostScript printers installed *after* the font installation *will not* have those fonts in their list. Also if you change the output port of an installed PostScript printer then your fonts will disappear unless the new port also had a PostScript printer assigned to it while the fonts were being installed.

To install an additional font:

1. Open the **ATM Control Panel**
2. Click on **Add...**
3. Double click on the source of the new font(s)
4. Click on the **Font files** you wish to add
5. Click on **Add**
6. Click on **Exit**.

You *must* restart Windows to access the new fonts. The system will prompt you to do this.

#### Important

When you install the fonts the system will prompt you with suggested paths for the files. Although you may change the path remember one thing, WIN-OS/2 ATM will also be installing the .PFB files and will place them in a different directory. You will be tempted to use the same directory for both OS/2 PM and WIN-OS/2. We recommend that you use the default settings because when you delete a font with the OS/2 PM Font Palette it will also prompt you to delete the .AFM font file. If you say "Yes" then it will also delete the .PFB file "without warning!" This will make the font unusable, although still installed, in WIN-OS/2. Allowing the system to keep your OS/2 PM and WIN-OS/2 fonts separate will save a lot of confusion in managing fonts.

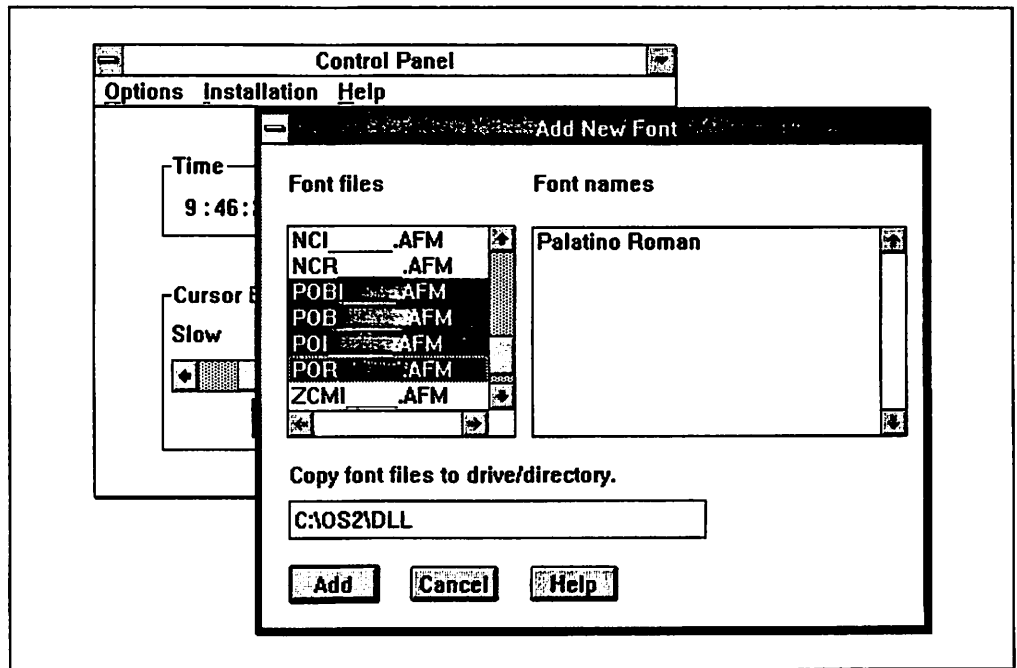


Figure 48. WIN-OS/2 Control Panel: Add New Font Dialog Box

These files are added to the \PSFONTS directory after installing the Berthold Bodoni Antiqua fonts.

#### \PSFONTS

5-01-90	8:00a	39648	0	bpci_.pfb
5-01-90	8:00a	38664	0	bpb_.pfb
5-01-90	8:00a	36930	0	bpi_.pfb
5-01-90	8:00a	37381	0	bpli_.pfb
5-01-90	8:00a	35979	0	bpl_.pfb
5-01-90	8:00a	38740	0	bpmi_.pfb
5-01-90	8:00a	38098	0	bpm_.pfb
5-01-90	8:00a	35837	0	bprg_.pfb

And these files are added to the \PSFONTS\PFM directory after installing the Berthold Bodoni Antiqua fonts.

#### \PSFONTS\PFM

4-10-92	10:42a	7016	0	BPBI_.PFM
4-10-92	10:42a	5830	0	BPB_.PFM
4-10-92	10:43a	6019	0	BPI_.PFM
4-10-92	10:43a	5934	0	BPLI_.PFM
4-10-92	10:42a	5700	0	BPL_.PFM
4-10-92	10:43a	7869	0	BPMI_.PFM
4-10-92	10:43a	5571	0	BPM_.PFM
4-10-92	10:43a	6004	0	BPRG_.PFM

#### Important

As information is added to the ATM.INI file, don't try to install or remove fonts just by copying or erasing files. Adding or deleting fonts must be done with the ATM Control Panel and/or the Print Manager.

## 4.7.4 Deleting Fonts for WIN-OS/2 ATM

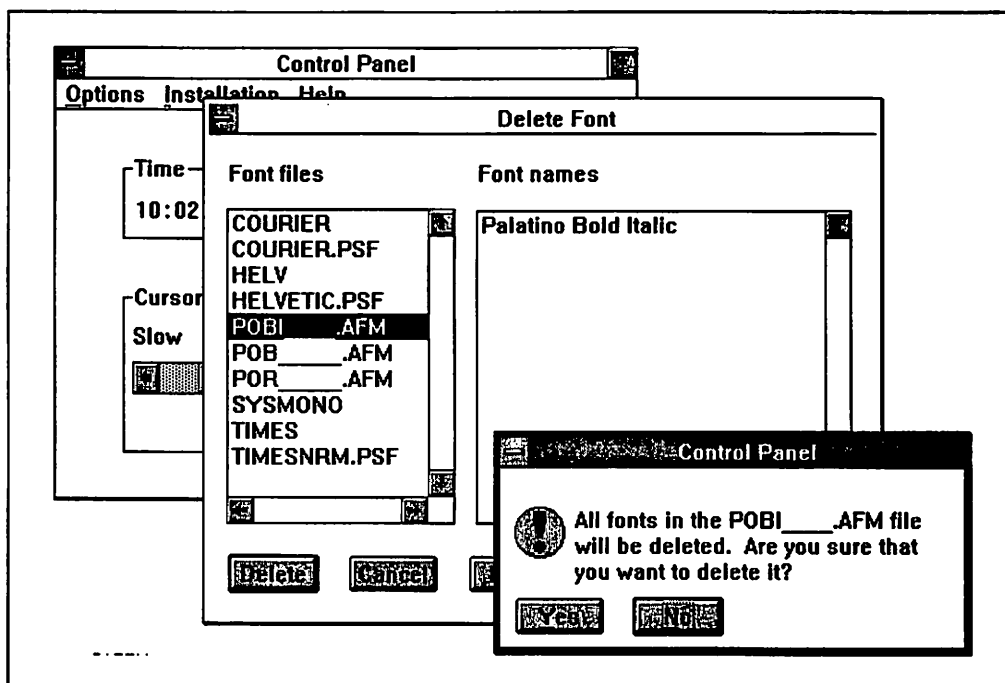


Figure 49. Control Panel: Delete Font Dialog Box

The standard core fonts and the additional Type 1 fonts have to be deleted with the ATM Control Panel. To delete them:

1. Open the ATM Control Panel
2. Click on the font(s) to be removed
3. Click on **Remove**
4. Click on **Yes** in the confirmation box
5. Click on **Exit**.

You *must* restart Windows to use the updated font list in the ATM.INI file. The system will prompt you to do this. The soft font entries in the WIN.INI file, however, *will not* be deleted. This means that you will still “see” the deleted fonts in the font list for your applications if you choose a printer (usually PostScript) that has these entries. Although the font name will appear, when you select it you will not get the expected screen font as it has been deleted from ATM. Instead you will get an installed font, usually Times or Helv, depending on the font you selected.

In order to remove the deleted fonts from the lists you must edit the \OS2\MDOS\WINOS2\WIN.INI file. The following example shows you a before and after version of the WIN.INI file if you wanted to remove all Berthold Bodoni Antiqua fonts from your application font lists.

#### WIN.INI after ATM delete but before manual edit

```
(PostScript,LPT2.0S2)
device=36
feed1=1
feed3=1
feed5=1
feed15=1
softfonts=12
softfont1=c:\psfonts\pfm\archi____.pfm,c:\psfonts\archi____.pfb
softfont2=c:\psfonts\pfm\balleeng.pfm,c:\psfonts\balleeng.pfb
softfont3=c:\psfonts\pfm\bpb____.pfm,c:\psfonts\bpb____.pfb
softfont4=c:\psfonts\pfm\bpbi____.pfm,c:\psfonts\bpbi____.pfb
softfont5=c:\psfonts\pfm\bp1____.pfm,c:\psfonts\bp1____.pfb
softfont6=c:\psfonts\pfm\bp1i____.pfm,c:\psfonts\bp1i____.pfb
softfont7=c:\psfonts\pfm\bprg____.pfm,c:\psfonts\bprg____.pfb
softfont8=c:\psfonts\pfm\bpm____.pfm,c:\psfonts\bpm____.pfb
softfont9=c:\psfonts\pfm\bpmi____.pfm,c:\psfonts\bpmi____.pfb
softfont10=c:\psfonts\pfm\bp1____.pfm,c:\psfonts\bp1____.pfb
softfont11=c:\psfonts\pfm\blackcha.pfm,c:\psfonts\blackcha.pfb
softfont12=c:\psfonts\pfm\saintfra.pfm,c:\psfonts\saintfra.pfb
```

#### WIN.INI after manual edit

```
(PostScript,LPT2.0S2)
device=36
feed1=1
feed3=1
feed5=1
feed15=1
softfonts=4
softfont1=c:\psfonts\pfm\archi____.pfm,c:\psfonts\archi____.pfb
softfont2=c:\psfonts\pfm\balleeng.pfm,c:\psfonts\balleeng.pfb
softfont3=c:\psfonts\pfm\blackcha.pfm,c:\psfonts\blackcha.pfb
softfont4=c:\psfonts\pfm\saintfra.pfm,c:\psfonts\saintfra.pfb
```

**Note:** In addition to deleting the line entries you must also renumber the remaining lines and edit the total number in the **softfonts=** statement. If you have more than one printer installed you may have to edit other groups in the WIN.INI under other port entries.

## 4.8 Printer Fonts

There is a great deal of confusion about terminology when it comes to printer fonts. You may hear "resident fonts" referred to as only the fonts that are built into the printer, or they may also include fonts "downloaded" into printer memory. These "downloaded" fonts may also be referred to as "soft" fonts. Fonts that are embedded in the printer data stream may also be referred to as soft fonts. For the purposes of our discussion we will refer to fonts based on *where* they are in the system.

There are five main system sources of printable fonts:

1. Those that are built into the printer
2. Those that are on cards or cartridges that plug into the printer
3. Those that are downloaded into nonvolatile storage in the printer

4. Those that are downloaded into volatile storage in the printer
5. And those that are downloadable in the print job.

#### **4.8.1 Built-In Printer Fonts**

Fonts that are "hardwired" in the printer must be installed by ATM if you want to see their true representation on the screen. The printer should have diskettes that have either screen fonts and/or Type 1 Fonts for this purpose. If you only install a few of these fonts in order to save memory remember, the font list in an application is based partly on the printer device driver's list of fonts and will show *all* of the printer fonts in their font lists.

#### **4.8.2 Font Cards and Cartridges**

Some printers allow you to plug in additional cards or cartridges that contain multiple fonts. In most cases the printer driver will allow you to "install" these cartridges in their printer properties. You must again install corresponding screen fonts if you want to see a true representation on the screen. If you install only some of the screen fonts you usually will still see all of the fonts on the cartridge in the application font lists.

#### **4.8.3 Downloaded Printer Fonts**

If you have additional fonts that you use on a regular basis it is better to have those fonts downloaded in the printer rather than having them as downloadable and embedded in each separate print job.

Most printers have memory set aside for additional fonts and some even have a disk drive. You can download fonts into these storage areas using either printer utilities or font utilities. An example of printer utilities is the LDRIVER program for the IBM 4019/4029. An example of font utilities are the PCSEND and PSDOWN programs that come with the Adobe Type 1 Font Library. As a rule, fonts downloaded into memory have to be downloaded every time you power-on the printer. This is referred to as volatile storage, whereas the fonts on a disk drive will remain in the printer until you delete them.

#### **4.8.4 Downloadable Printer Fonts**

If you only install additional fonts in the Font Palette or ATM Control Panel then the system will download these, character by character, in the data stream sent to your printer. Various printer drivers now also support downloadable fonts which will send the entire font file in the data stream of your printer. You install these fonts using the Font options in the Settings of the printer drivers. The one current exception is in WIN-OS/2 using the PostScript printer driver. In this case, when you install a Type 1 font in the ATM Control Panel, the WIN.INI file will be automatically updated with an information line to do this downloading.

This section uses Type 1 fonts and the PostScript driver for OS/2 as an example. There are other font formats that can be used with other printer drivers. Most come with utilities to generate screen fonts and/or printer fonts that are compatible with the system. Again we are using Type 1 and PostScript only as an example to emphasize the importance of the coordination needed between screen and printer font management.

#### 4.8.4.1 Installing Downloadable Printer Fonts for OS/2

There are many printer drivers that will allow you to install downloadable fonts. For this example we will use the PostScript printer driver. To make downloadable fonts available from OS/2 to your PostScript printers:

1. Open the settings of *any* Printer Object
2. Click on **Printer Driver** tab
3. Open the settings of *any* PScript printer driver displayed
4. Click on **Fonts...**
5. Insert diskette or type in path of fonts to install
6. Click on **Open**
7. Click on the font(s) you wish to add
8. Click on **Add**.

##### Note

If you have multiple PostScript printers, the installation of downloadable fonts need only be done once. Once installed, downloadable fonts are available to any PostScript printer object on your desktop and, therefore, any PostScript printer connected to your system.

In the example notice that the path for the New font directory has been changed to C:\OS2\DLL. If you have already installed these fonts with the Font Palette then you can use this directory to create your downloadable font files. It is much quicker and you are assured that the matching screen fonts will be available for the applications.

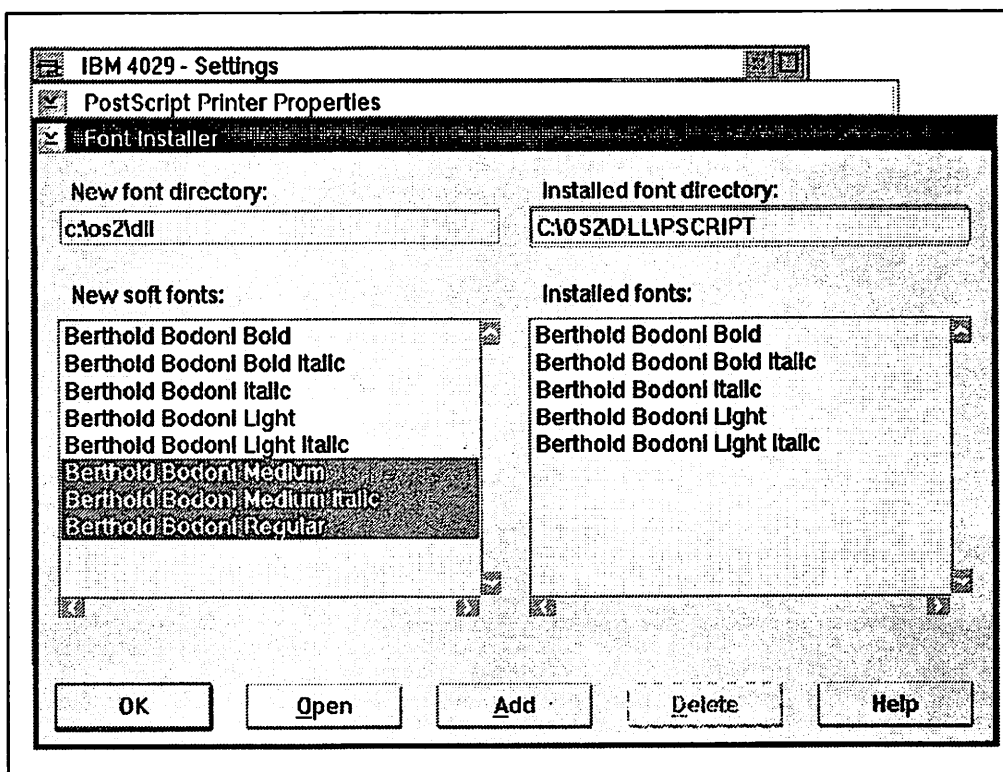


Figure 50. OS/2 PostScript Printer Device Driver Settings: Font Installer

These files are added to the \OS2\DLL\PSCRIPT folder after installing the Berthold Bodoni Antiqua fonts as downloadable.

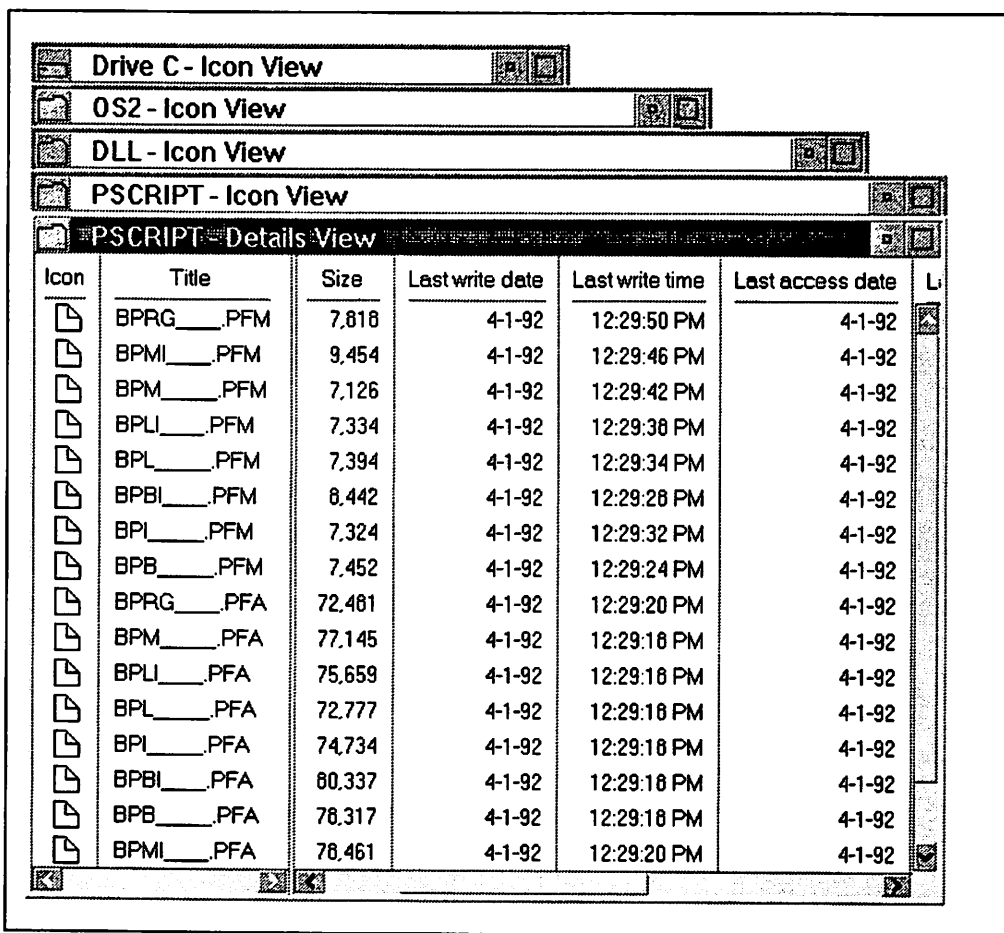


Figure 51. PSCRIPT Folder after Installing Berthold Bodoni Antiqua Fonts

The .PFA file holds the same data as the .PFB, but is translated from binary to ASCII. It contains the ASCII PostScript description of fonts. The .PFM file contains the same data as the .AFM file, but is translated from ASCII to binary. It contains the font metric of the fonts.

#### 4.8.4.2 Deleting Downloadable Printer Fonts for OS/2

To delete downloadable fonts in OS/2 for your PostScript printers:

1. Open the settings of *any* printer object
2. Click on **Printer Driver** tab
3. Open the settings of *any* PScript printer driver displayed
4. Click on **Fonts...**
5. Click on the font(s) you wish to delete
6. Click on **Delete**.

### 4.8.4.3 Downloadable Printer Fonts Formats

#### *IBM 4019/4029 Printer Fonts*

**Font Type:** Bitmap.  
**Char. Size:** 6, 8, 10, 12, 14, 18, 24, 30 point.  
**Font Size:** 100KB per font.  
**Source:** IBM and other suppliers.  
**Installed by:** IBM4019 printer device driver settings.  
**Deleted by:** IBM4019 printer device driver settings.  
**Location:** \4019FONT\\*.DLF  
                  \4019FONT\\*.FMF.  
**Remarks:** These software fonts consist of two files. The .DLF file is the font description which is actually downloaded to the printer. The .FMF file contains the font metrics, which describe the font to Presentation Manager.  
  
The IBM 4019/4029 can also use 41 font cards, two at one time. During the installation, of these font cartridges, the printer device drivers will read the .PMF file and unpack its content. It will create two small files per font and store them in a separate directory, such as C:\4019FONT. The same mechanism exists for the IBM 5202 and IBM 5204 printers and their font cartridges.

#### *PostScript Printers Fonts*

**Font Type:** Outline.  
**Char. Size:** Any.  
**Typefaces:** About 1000 (end of 1990).  
**Font Size:** 100KB per font.  
**Source:** Adobe and other suppliers.  
**Installed by:** Pscript printer device driver settings.  
**Deleted by:** Pscript printer device driver settings.  
**Location:** \PSFONTS\\*.PFA  
                  \PSFONTS\\*.PFM.  
**Remarks:** The .PFA file is the font description and the .PFM file the font metrics.

#### *HP LaserJet Soft Fonts*

**Char. Size:** 4 to 200 point.  
**Font Type:** Bitmap.  
**Font Size:** 20 to 30KB per font.  
**Source:** Hewlett Packard and others.  
**Installed by:** HPLASER.DRV printer device driver settings.  
**Deleted by:** HPLASER.DRV printer device driver settings.  
**Location:** \OS2\DLL\HP\PCL\\*.SFP  
                  \OS2\DLL\HP\PCL\\*.FNT  
**Remarks:** The .SFP file is the font description and the .FNT the font metrics. In HP LaserJet emulation, the IBM 4216 and the IBM 4019/4029 are able to print these HP LaserJet soft fonts while running in HP LaserJet emulation.

#### *IBM 420X Printer Fonts*

**Font Type:** Bitmap.  
**Font Size:** 10 to 20KB per font.  
**Source:** IBM.  
**Installed by:** User.



Deleted by: User.  
Location: C:\42XXFONT\\*.BIN

---

## 4.9 Fonts Shipped with OS/2 V2.0

Thirteen IBM Core Fonts are provided with OS/2 V2.0. These come in four families:

- Times New Roman - Normal, bold, italic, bold italic (previously TmsRmn)
- Helvetica - Normal, bold, italic, bold italic (previously Helv)
- Courier - Normal, bold, italic, bold italic
- Symbol.

The bitmap fonts are still available under their old names of Helv and TmsRmn.

Times new Roman	<b>bold</b>	<i>italic</i>	<b><i>bold italic</i></b>
Helvetica	<b>bold</b>	<i>italic</i>	<b><i>bold italic</i></b>
Courier	<b>bold</b>	<i>italic</i>	<b><i>bold italic</i></b>

Figure 52. OS/2 V2.0 Type 1 Fonts Shipped with OS/2 V2.0

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## 4.10 Other Suppliers of Type 1 Fonts

Adobe supplies tools (BuildFont) that allow font foundries to convert their existing outline font data to the Type 1 fonts format. This ability allows other vendors to distribute their own fonts in Type 1 fonts format, and adds to the large number of fonts already available from Adobe themselves. Some of the companies who have converted or are converting their libraries into Type 1 format are:

Agfa-Compugraphic  
Autologic  
Bitstream  
Linotype  
Monotype  
Morisawa  
Vartityper.

Other sources may not be as visible. For example, CorelDraw! ships with its own outline typefaces. It also has a program, WFNBOSS, that will allow you to convert the CorelDraw! typefaces into Type 1 fonts. You can then install them in OS/2 and WIN-OS/2.

---

## 4.11 Creating Fonts

One might think that with the numerous fonts available that you could always find one to fit your needs. However, as unique as each of us is, so to is the requirement to use a specific *look* of type to help us get the printed message across. It is with this in mind that programs exist to allow you to either modify existing typefaces or create your own from scratch.

Application programs exist that allow you to display an existing font, reshape the characters or create new ones and then save the character to a place back in



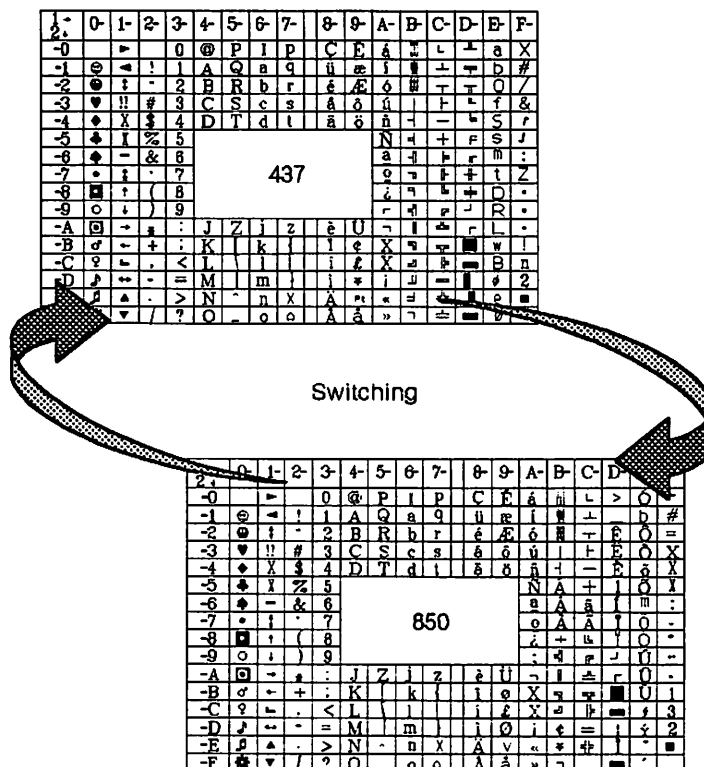


Figure 54. Code Page 437 Versus 850

A code page does not define how the characters look, but only what they are. The “look” of the characters is defined by the font being used.

The code page for the United States is code page 437. This code page is found in almost all of the IBM compatible PC printers, and therefore is always the default code page of these printers.

OS/2 supports a number of different national languages. Code page support becomes important if your non-PM applications will run in a multi-language environment. For example, a word processor could have a command that enables the user to switch between English and Portuguese displays to edit documents produced in either code page. In the PM environment you could also have two different editor sessions using two different code pages. For a list of supported code pages see also 4.14, “National Language Support” on page 98.

Presentation Manager is “code page independent.” However, it will produce the text characters that apply to the primary code page, which is specified via the CODEPAGE statement in the CONFIG.SYS file. For OS/2 full screen sessions (screen groups) and OS/2 VIO windows under PM, you can specify different (secondary) code pages. Then of course, you also need an appropriate code page definition for your keyboard.

To illustrate how Presentation Manager handles the different code pages we can take a closer look at the following figures.

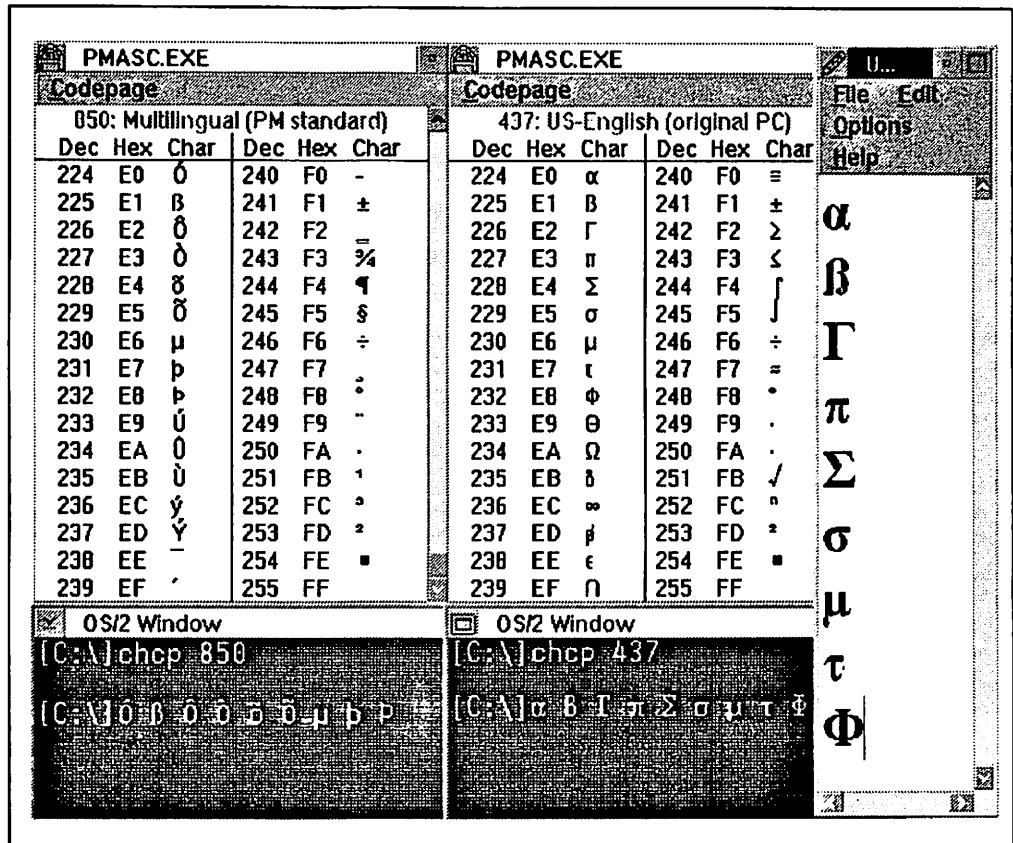


Figure 55. Different Code Pages on One Workplace Shell Screen

#### Notes:

1. The two windows in the upper-left corner and in the middle of this PM screen are showing a special PM code page browse utility<sup>1</sup>. It allows the user to browse different code pages under PM, regardless of what the general system setup is. This illustrates also that PM is code page independent. You may notice some differences between the code page 850 shown in the left window and the code page 437 shown in the middle window.
2. The system is set up for using the primary code page 437.
3. Thus, PM is emulating code page 437 and the sample text in the system editor (window on the right) displays exactly those (437) characters.
4. The OS/2 VIO window in the lower-left corner is switched to use the secondary code page 850. Therefore, all characters displayed in this window comply with code page 850.
5. The OS/2 VIO window middle lower is switched to use the primary code page 437. Therefore, all characters displayed in this window comply with code page 437, even though they are still the same ASCII values as the ones in the window to the left. The characters being displayed are also the same as the system editor, the window on the right, shows for these ASCII values.

<sup>1</sup> This utility was written by Charles Petzold and its source code was published and described in *PC Magazine*, Vol.8, Nos. 14 & 15, 1989.

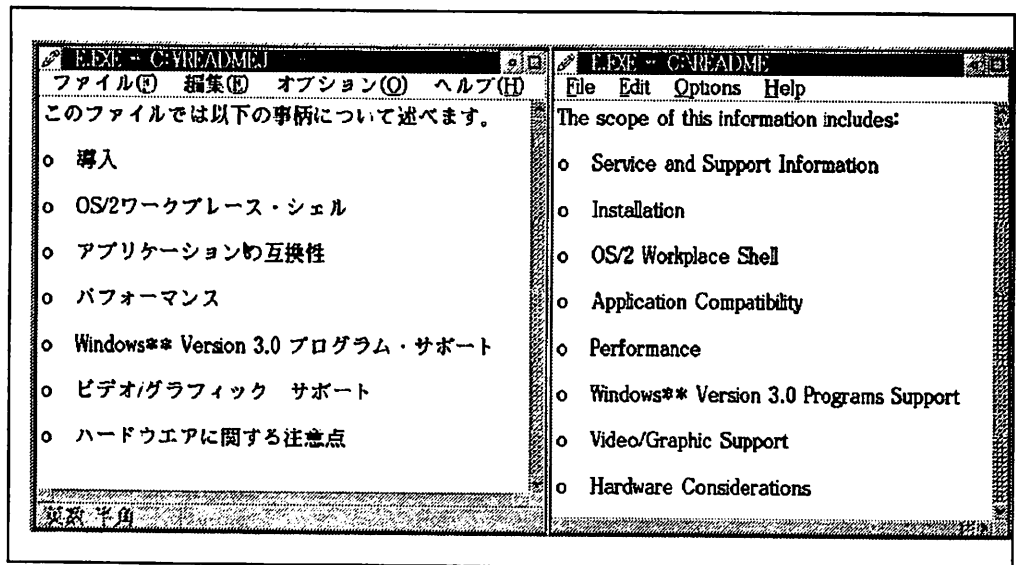


Figure 56. Two Editor Sessions Started from OS/2 Windows on a DBCS Machine

#### 4.12.1 Code Pages and PostScript Printers

When printing on a PostScript printer, with fonts that are resident in the printer and the user asks to print in a code page that does not exist in the printer's device font set, missing characters will be replaced by a space. If the font is one of the IBM Core Fonts, which can be downloaded to the printer, then all of the code pages supported by Presentation Manager can be printed because all the characters exist.

#### 4.12.2 Code Pages and Non-PostScript Printers

If printing on a non-PostScript printer and the font is an off-the-shelf Type 1 Font, then all of the code pages supported by PM can be printed. However, there may be characters missing from the font definition. In this case the printer substitutes a character or a space.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		☺	☻	♥	♦	♣	♠	•	▪		♂	♀	♂	♀		♂
1	▶	◀	↑	!!	¶	§	—	†	‡	↓	→	←	↔	▲	▼	
2		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	Δ
8	Ç	ù	é	â	ä	à	å	ç	ê	ë	è	ï	î	ì	Å	Ä
9	É	æ	Æ	ô	ö	ò	û	ü	ÿ	Ö	Ü	ø	£	Ø	×	f
A	á	í	ó	ú	ñ	Ñ	•	°	¿	®	¬	½	¼	;	«	»
B	⋮	⋮	⋮			Á	Â	À	⊙	¶		¶	¶	¶	¶	¶
C	L	⊥	T		—	†	ã	Ã	ℒ	℔	⊥	⊥	⊥	⊥	⊥	⊥
D	ð	Ð	Ê	Ë	È	ı	í	î	ï	Ĵ	Œ	■	■	■	■	■
E	Ó	β	Ô	Ò	Õ	Ö	μ	þ	þ	Ú	Û	Ü	Ý	Ý	—	'
F	-	±	—	¾	¶	§	÷	.	°	"	.	1	3	2	.	

Figure 57. OS/2 V2.0 Type 1 Font Support for Code Page 850 (Courier)

## 4.13 International Character Support

Most of Adobe's Type 1 fonts include 228 characters, which cover most of the standard Latin character set, and all of the code page 850 set except one, the Greek mu character -  $\mu$  - 230. However, some PM code pages will include characters that are not available in Adobe's standard set of characters; additional characters may be obtained from a standard set built into PM, but they will not necessarily be stylistically related to the other characters in the typeface. You can see this if you print out the code page 850 character set in an additional Type 1 font like ITC Zapf Chancery. The mu character will look different from the other characters.

The Type 1 fonts included in OS/2 (IBM Core Fonts: Times New, Helvetica and Courier) have a wider range of characters, so there will not be quite as many discrepancies.

In additional Type 1 fonts that the user may install, Greek characters from the code page 437 set will be the most apparent omissions from the standard set of 228. In this respect, support of existing Type 1 fonts represents a compromise. The characters will be available, but not necessarily match the typeface or attributes (bold, italic etc.) required. The following figure shows this substitution when using Zapf Chancery with code page 437 and 850. Notice, however, that all of the accented alphabetic characters occurring in code page 850 are supported.

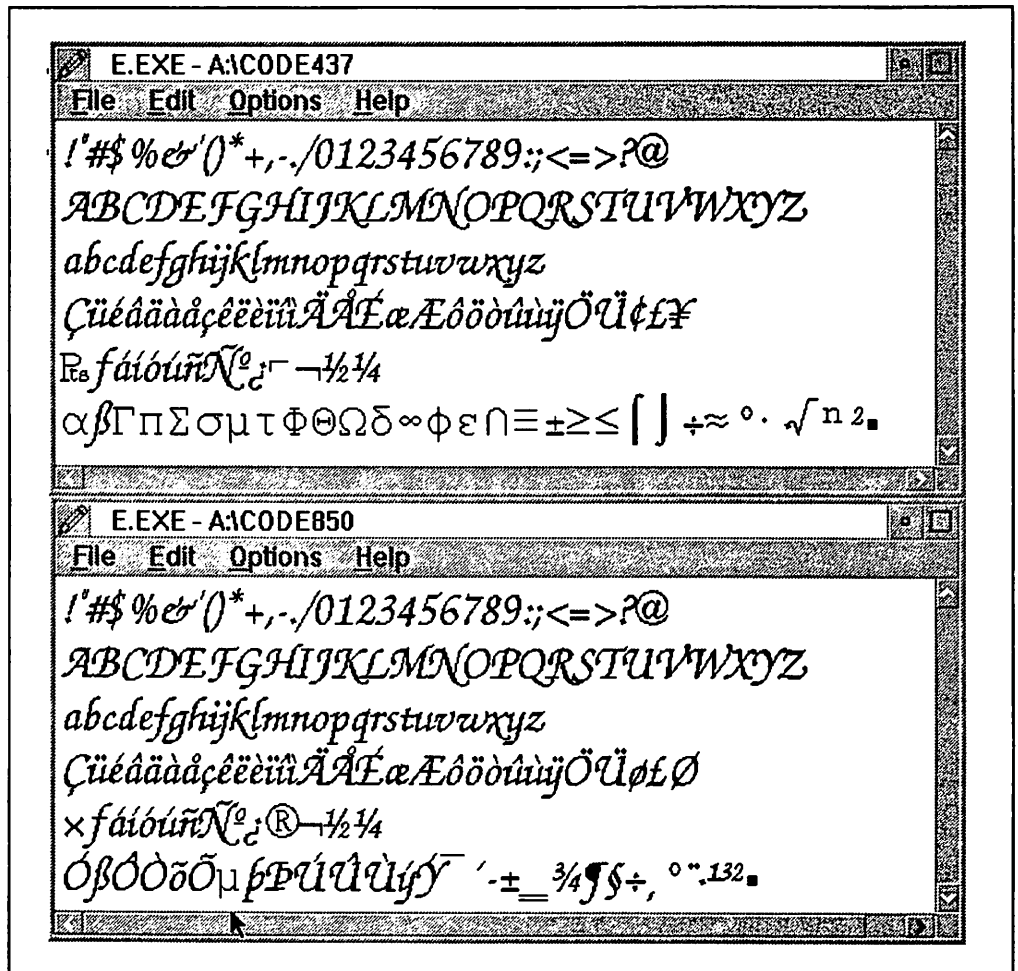


Figure 58. Replacing Undefined Characters in Zapf Chancery with Courier

## 4.14 National Language Support

OS/2 V2.0 has national language support for 13 languages:

- Canadian French
- Danish
- Dutch
- Finnish
- French
- German
- Italian
- Norwegian
- Portuguese
- Spanish
- Swedish
- United Kingdom English
- United States/Universal English.

Besides these translated versions there is a special Japanese version of OS/2, V2.0J. This version supports most of the very special requirements for this country such as fully expanded double byte character support (DBCS). It also supports some of the special Japanese PS/2s which can actually display and

print those characters on special output devices. Of course, the keyboard requires a different interface as well.

The following is a list of the supported code pages:

<i>Table 1. NLS Country Codes and Code Pages</i>		
<b>Country</b>	<b>Country Code</b>	<b>Code Pages Supported (primary/secondary)</b>
Arabic	785	864 / 437 or 850
Asian English	099	437 / 850
Australia	061	437 / 850
Belgium	032	437 / 850
Canadian English	001	437 / 850
Canadian French	002	863 / 850
Czechoslovakia	042	852 / 850
Denmark	045	865 / 850
Finland	358	437 / 850
France	033	437 / 850
Germany	049	437 / 850
Hebrew	972	862 / 437 or 850
Hungary	036	852 / 850
Iceland	354	850 / 861
Italy	039	437 / 850
Japan	081	932 or 942 / 437 or 850
Korea	082	934 or 944 / 437 or 850
Latin America	003	437 / 850
Netherlands	031	437 / 850
Norway	047	865 / 850
People's Republic of China	086	936 or 946 / 437 or 850
Poland	048	852 / 850
Portugal	351	860 / 850
Spain	034	437 / 850
Sweden	046	437 / 850
Switzerland	041	437 / 850
Taiwan (Traditional Chinese)	088	938 or 948 / 437 or 850
Turkey	090	857 / 850
United Kingdom	044	437 / 850
United States	001	437 / 850
Yugoslavia	038	852 / 850





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## Chapter 5. Output Configurations

With the introduction of OS/2 output considerations extend well beyond one printer configured for each port. Concepts such as Pooling, Printer Object Sharing and Automatic Emulation Switching through printer drivers instead of additional code are discussed. Techniques such as COM3-4 support for the ISA/EISA bus are explained. Discussions on physical vs. logical ports, and the parallel vs. serial interfaces complete this chapter.

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### 5.1 Physical Connections

The physical connections addressed by OS/2 are:

- Parallel ports LPT1 to LPT3
- Serial ports COM1 to COM4.

Support for the ports listed above is through OS/2 kernel device drivers provided with the standard operating system. If the users want to use additional adapter cards for these ports they have to make sure that those cards comply with the specified interface definitions, or come with their own OS/2 supported device drivers. The open architectures of the PC, PS/2 and OS/2 also allow you to install adapter cards which deliver additional I/O ports other than these standard ones. Again, they need to be supported by their own device drivers.

#### Note

OEM I/O cards which work fine under DOS, may not automatically work under OS/2!

It is highly recommended that each new OEM card be thoroughly tested under OS/2 if it is desired to be used there. It either has to comply 100% with the standard interface specifications or be supported by its own device driver. Some of the OEM parallel cards on the market support the correct I/O addresses, but do not support the correct interrupt levels. Compared to DOS, this is a serious problem, because OS/2 uses the hardware interrupt mechanism to communicate with devices attached to these I/O cards.

#### 5.1.1 Parallel Ports

The parallel ports are among the best standardized connections on personal computers and personal systems. They are often called by the name of the company that introduced the standard, **Centronics interface**. This company developed this parallel interface in the early 1970s when they started to develop a low cost printer which could be used on a variety of existing computers. Over the years it emerged as a defacto standard which is now supported by nearly every personal computer in the world. Since there are almost no modifications to this interface it is found to be very compatible between most computer and printer manufacturers and is the most reliable printer connection available today.

In general there is not much a parallel connected printer can tell the operating system about its status, just **Paper empty**, **Busy** and some kind of a general **Error**. The operating system must either make a best guess or display a general error in which case it is up to the user to check paper, connections, and power.

If all else fails usually resetting or turning the printer off then on will clear the error but not necessarily the problem. Historically, this parallel interface is a one-way communication path. That means the computer sends data to the printer and never expects any data from the printer, except the three extra hand-shaking signals on these separate lines. IBM enhanced this parallel interface to a bi-directional port on all PS/2 machines. However, this option is not currently used when printing under OS/2 since almost none of today's printers support this feature. Consequently, there is no way a parallel printer can interact with the operating system, other than to just accept data and act upon the information contained in it. In return, the operating system has to be 100% accurate about the data stream being sent to any parallel printer, or it takes the risk of the printer getting stuck where only an operator inquiry can get it back to work. Under OS/2, the printer drivers are responsible for this.

One advantage of the parallel interface is that it has an extra line which allows the system to reset the printer. In fact, the OS/2 printer drivers use this signal in order to reset the printer before they send any print data. This is the only way it can be sure of finding the printer in an exactly defined status. From this point on, the drivers can load fonts, set form definitions, etc. Any other method would lead to unpredictable results since there is no way for the operating system to query the printer status via this interface.

As printers become more sophisticated, physical switch setting is being replaced by intelligent control panels that allow the user to change and save the default configuration to be used at power-on or printer reset. However, just because a printer has a control panel doesn't mean that the settings you enter will become the default.

**Note**

The fact that the settings of the printer do not match those of the job that is being sent is one of the most common reasons for jobs not to print.

Another advantage of the parallel interface is that OS/2 can install a device monitor for it. One use of this monitor is to enable redirection of parallel ports to other parallel or serial ports. Another is to be able to capture and modify the data being sent.

The tables and diagrams of the basic layout of the interface are also shown in *Technical Reference* manuals for the printers.

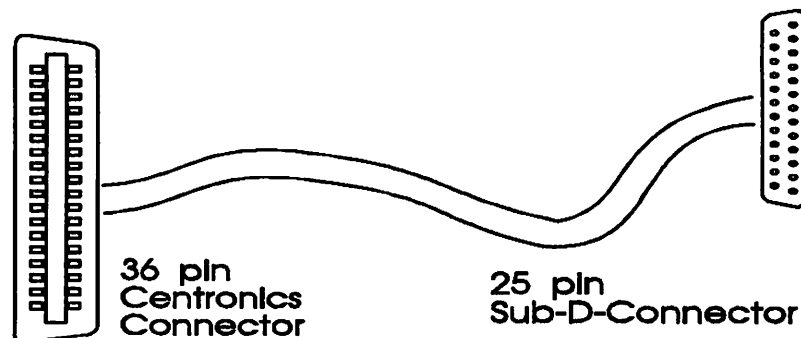


Figure 59. Typical Parallel Cable and Connectors

The parallel printer cable uses a 25-pin sub-D plug on one end and a 36-pin "Centronics" plug on the other end. Other manufacturers may use other plugs even if the signals on the cable are the same.

The parallel interface carries data byte-parallel on eight data lines. In addition to these eight data lines, there are some data flow control lines to make sure that the connected device is fed with the right amount of data.

The following is the standard pin layout for the parallel interface, found on the 25-pin sub-D plug:

<b>Pin 1</b>	Strobe
<b>Pin 2</b>	Data Bit 0
<b>Pin 3</b>	Data Bit 1
<b>Pin 4</b>	Data Bit 2
<b>Pin 5</b>	Data Bit 3
<b>Pin 6</b>	Data Bit 4
<b>Pin 7</b>	Data Bit 5
<b>Pin 8</b>	Data Bit 6
<b>Pin 9</b>	Data Bit 7
<b>Pin 10</b>	Acknowledge
<b>Pin 11</b>	Busy
<b>Pin 12</b>	Paper empty
<b>Pin 13</b>	Select
<b>Pin 14</b>	Auto feed XT
<b>Pin 15</b>	Error
<b>Pin 16</b>	Initialize
<b>Pin 17</b>	Select in
<b>Pin 18-25</b>	Signal ground.

**Notes:**

1. Pins 1, 10 and 11 are used for handshaking purposes.
2. Pins 12 and 15 are used for error indication from the printer.
3. Pins 13, 14 and 17 are seldom used in today's environments but are needed for bidirectional support.
4. A signal on pin 16 will reset the printer.

Even though the interface is very well standardized, there are some variations in the use of some of the interface signals. These variations occurred mostly before the introduction of the IBM PC; however, some of today's printers still vary from the standard. Therefore, it may happen that a printer connected to a parallel interface does not work right away. In that case it is important to consult the printer manual for some possible switch settings.

Under previous architectures, it was not uncommon for users to specify hardware addresses and interrupt levels for the port they wanted to use by using dip switches and jumpers. Using Micro Channel\* or EISA with OS/2 such specifications do not exist. The configuration is defined during the setup procedure for the hardware, and OS/2 gets its information from there. The port address and hardware interrupt level combinations used are described in the following tables.

<i>Table 2. Supported Pairs Under OS/2 V2.0 for Two LPT Ports (Case 1)</i>				
Port	Address	AT Bus (ISA)	EISA Bus	Micro Channel
LPT1	3BC	IRQ7	IRQ5 or 7	IRQ7
LPT2	278	IRQ5	IRQ5 or 7	IRQ7

<i>Table 3. Supported Pairs Under OS/2 V2.0 for Two LPT Ports (Case 2)</i>				
Port	Address	AT Bus (ISA)	EISA Bus	Micro Channel
LPT1	378	IRQ7	IRQ5 or 7	IRQ7
LPT2	278	IRQ5	IRQ5 or 7	IRQ7

<i>Table 4. Supported Pairs Under OS/2 V2.0 for Three LPT Ports</i>				
Port	Address	AT Bus (ISA)	EISA Bus	Micro Channel
LPT1	3BC	IRQ7	IRQ5 or 7	IRQ7
LPT2	378	IRQ7	IRQ5 or 7	IRQ7
LPT3	278	IRQ5	IRQ5 or 7	IRQ7

**Note**

When upgrading from DOS to OS/2, many print problems can be resolved by configuring to one of these levels. The AT bus does not share hardware interrupt levels, therefore each adapter must be on a separate interrupt level.

A common problem for DOS users upgrading to OS/2 is hardware interrupt contention. DOS does not use hardware interrupt levels to print but OS/2 does to ensure multitasking. Other adapter cards which use IRQ5 or IRQ7, such as sound boards and tape drives, will cause OS/2 to fail to print. Either change the interrupt level of these boards or remove them to eliminate the hardware interrupt level conflict.

Be aware that we have seen some AT bus I/O adapters that do not interrupt properly and this may be the source of your printing problems. This is especially true if you have upgraded from DOS, could print from DOS, and you are sure you do not have a hardware interrupt level conflict on your parallel ports.

OS/2 can make use of the parallel ports LPT1 to LPT3. These standard ports are supported through the standard parallel port device driver PRINT02.SYS for PS/2s with Micro Channel and PRINT01.SYS for AT-Bus (ISA) and EISA machines. This device driver is automatically loaded by a statement in the CONFIG.SYS file.

Since almost all of today's PCs come standard with only one parallel port we installed two adapter cards. These cards can be configured as LPT1, LPT2 or LPT3 and worked perfectly under OS/2 to give us three parallel ports supported by the base operating system device drivers. For information on IBM and OEM Micro Channel adapter cards, please refer to *IBM Catalog of Micro Channel Expansion Adapters*, order number G360-2824.

## 5.1.2 Serial Ports

Serial ports have the advantage of using fewer wires than the standard parallel interface. A three-wire connection can be enough to support a fully functional printer connection. This makes cabling easier, cheaper, and allows for greater distances between computer and peripheral device. For all of these reasons, the serial interface is most often used for long distance communication with or without a modem.

The price you pay for the above mentioned advantages is speed. Whereas a parallel connection may carry over 500 kilobytes per second, a serial connection on a PC, or a PS/2, is limited by the need for protocol negotiation between computer and device. This may reduce the effective data rate by as much as 50%. It also depends on the capabilities of the computer and printer, as well as the operating system itself. But this is again limited by the capabilities of the printers connected to them and the characteristics of these I/O ports. In fact, although the maximum configurable data rate per serial port under OS/2 2.0 may be 345,600 bits per second (baud) depending on the hardware, printers are most reliable at a maximum setting of 9600 baud.

Remember that serial ports have many uses beyond attaching printers. The most common of these are modems and mice.

The electrical interface of a serial port is by far less complex than that of a parallel port. The need for protocols, however, makes the serial interface much more flexible, but also more complex on the controlling software part, the kernel device driver. Over the years, several standardization organizations have tried to standardize this interface. RS-232-C and V.24 are only two of the many and even these two have many variations. The variations can be found in any area, like the use of connectors, protocols, cable shielding requirements, speed, etc.

A standard serial interface has the following pin layout:

<b>Pin 1</b>	Not connected
<b>Pin 2</b>	Transmit data
<b>Pin 3</b>	Receive data
<b>Pin 4</b>	Request to send
<b>Pin 5</b>	Clear to send
<b>Pin 6</b>	Data set ready
<b>Pin 7</b>	Signal ground
<b>Pin 8</b>	Data carrier detect
<b>Pin 9-19</b>	Not connected
<b>Pin 20</b>	Data terminal ready
<b>Pin 21</b>	Not connected
<b>Pin 22</b>	Ring indicate
<b>Pin 23-25</b>	Not connected.

As the basic serial interface is usable only for specific devices like teletype-writers, or for devices that use the teletype specifications, the serial interface has several control lines in parallel to the data lines. That does not make it a parallel interface, because the data is still being transferred bit-serial. These additional lines are mainly used to control a local device like a modem. When it comes to serially connected printers, one has to follow the printer manufacturer's specifications to make sure the printer will work. In general it can be said that the most important things are:

1. Use the specified cable. The cabling is very important when it comes to protocols and speed.
2. Ensure that the computer, its operating system (OS/2), and the printer use the same communications setup:
  - Baud rate
  - Parity bits
  - Data bits
  - Start/Stop bits
  - Protocol.
3. Follow exactly, the manufacturer's recommendations for all settings.
4. To avoid additional trouble, choose slow transmission speeds in the beginning.
5. Use 8 data bits if possible; otherwise, you may not have access to the ASCII characters from 128 to 255, if the printer's fonts will be used.
6. Use a device called "line spy" to ensure that all signals on the cable are being used as required. This is a small device which is chained into the serial cable connection and shows the presence of certain or all RS-232 signals. It helps to detect missing handshake signals or conflicts. You also can easily detect if there is any data sent at all or if this line is not in use. Those devices are usually sold in electronic stores and are not very expensive, depending on the functionality they provide.

#### Watch Out

The fact that a printer prints, does not imply that all the definitions are correct!

Let's discuss an example. During our tests for Chapter 6, "Printing from Applications" on page 119, we encountered some strange problems with our serially connected QMS-100 Color PostScript printer. It printed fine until we reached the point where we had to print more complex graphics like a big metafile. The printer either didn't print anymore or printed garbage. We chose XON/XOFF as the handshake protocol for this printer. Unfortunately, this protocol is only good as long as both, the printer and the computer, react fast enough on any buffer overflow conditions. Changing the protocol to *hardware* requires the appropriate and recommended cable, but does avoid this kind of problem. The correct cable is very important since there is more than one way of performing this *hardware* protocol.

Lowering the baud rate may only postpone the problem, because later you can still run into a buffer overflow situation. Changing the connection to parallel also solves this problem. Unfortunately, the printer may not have this option, or you may have run out of parallel ports on this system. This also shows the importance of specifying the correct serial port definitions. This is done either via the printer object output settings or via the MODE command.

#### Note

PM printer drivers will rely on the definitions, which are made with the printer object output settings! Don't use the MODE command for this purpose.

The serial interface does not provide any signal line which would allow the system to reset the printer. This can only be done using software command sequences. If the printer refuses to communicate with the printer driver, there is no way to reset the printer except by an operator inquiry. For this reason it is very important for the printer drivers to have a timeout value specified for those printers. This would be the only way the printer driver could "declare" the printer "hung" and tell the printer object to hold back all print jobs for it.

Another disadvantage with the serial interface is that OS/2 can't install any device monitors which can "watch" these ports.

So, the advantage of a serial over a parallel connection can be:

- Longer distances.

Where the disadvantages can be:

- Different cables for different devices
- Have to set up protocol
- Complex handshake problems
- Problems in stressed environments (magnetic fields)
- Slower transmission speed
- In some cases not as reliable as parallel connections
- No device monitor support
- No OS/2 spooling for WIN-OS2 print jobs.

Most PCs have a serial interface as a standard port. Additional serial ports can be added with the installation of either serial interface cards or with the installation of a modem card. During the setup of the PC, the ports are assigned their respective numbers like COM1, COM2 and so on.

These cards, in addition to the serial port on the planar, enabled us to set up COM1 through COM4. These standard ports are supported through the standard serial port device driver COM.SYS.

This device driver is loaded through the following statement in CONFIG.SYS:

```
DEVICE=C:\OS2\COM.SYS
```

This driver supports extended hardware buffering on IBM's serial Micro Channel adapter cards, which results in more reliable throughput at higher data rates.

**Note**

On ISA and EISA channel machines, such as the IBM AT, the COM.SYS serial port device driver, as installed, only supports COM1 and COM2. To extend this support to COM3 and COM4 see the following section.



### 5.1.3 COM3/COM4 Support for ISA/EISA Bus

In addition to the initial install of COM1 and COM2, COM.SYS will also support COM3 and COM4 ports on AT bus machines. In order to use COM3 and/or COM4 on AT bus machines it is necessary to include parameters on the `DEVICE=COM.SYS` command in the `CONFIG.SYS`. The format of the statement is:

```
DEVICE=COM.SYS (N,XXX,I)
```

where N is the COM port number ( 3 or 4 )  
XXX is the I/O port address ( 3E8, 2E8, etc )  
I is the IRQ (interrupt) level ( from 1 to 15 )

The I/O port address will be found in the specifications for the adapter card. The port address must be unique for each COM port. The port address for COM1 is 3F8 and for COM2 it is 2F8.

The IRQ level must be chosen in such a way that it does not conflict with another adapter card in the system. COM1 uses IRQ4 and COM2 uses IRQ3. It is possible that the IRQ level of the COM3 or COM4 adapter cards is not settable and will default to either IRQ3 or IRQ4. In this case it is still possible to have up to four COM ports installed. However, if two or more ports use the same IRQ level, it is only possible to have one of those ports active at any one time. If the IRQ level is settable on the adapter card, choose an IRQ level not used in the system. Levels that are usually available include 5, 10 and 15. Note that IRQ5 may conflict with your second parallel port, if installed.

---

## 5.2 Logical Connections

The number of physical ports on any system is limited by the hardware and the BIOS that supports these ports. On a single user system, this number is more than sufficient. On a network, however, this is all very different. There may be, as in our test environment, 26 personal systems with 13 shared printers and numerous direct attached printers, or it may even be many, many more. Therefore, the basic assignments of ports are exhausted in no time at all.

In order to make the PCs flexible, the BIOS always contained some code that allowed, in conjunction with DOS or OS/2, the redirection of data streams. With a command, the data meant to be sent to one port can be redirected to another port on the same system or on another one. Imagine you have two systems with one parallel port each. They are by default LPT1 on each system. One printer shall be connected to each LPT1. So, on each system, the data will be sent to the logical port LPT1. If you now want to send data to the other system, you have to use a different logical port. So, you may chose LPT2 as the logical port for sending data to the printer on the other system. Then map the *logical port* LPT2 on system 1 to the *physical port* LPT1 on system 2.

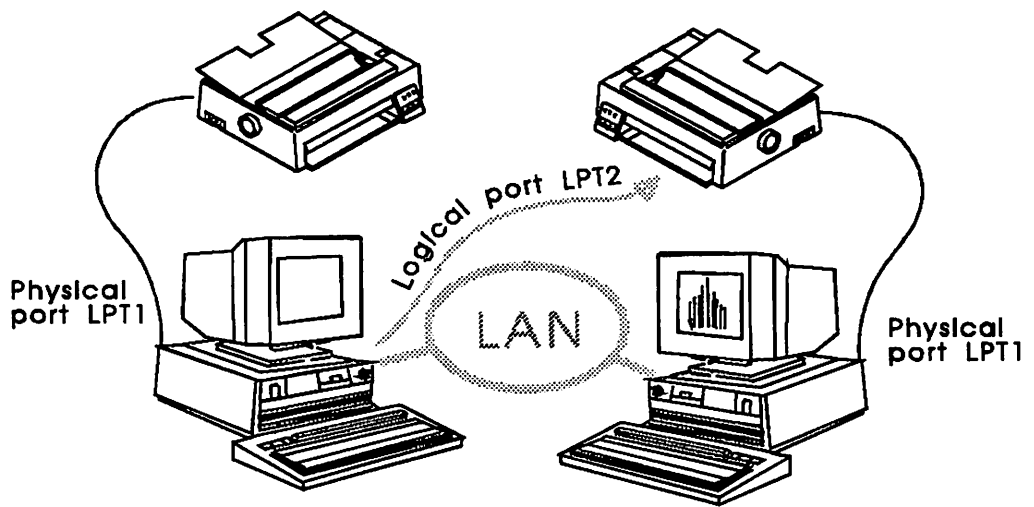


Figure 60. Assignment of a Logical to a Physical Port

This flexibility of the operating system goes beyond the LAN. It is also possible to redirect ports toward a mainframe, or another minicomputer somewhere on the network, or another connection to it such as SDLC or X.25. In fact, the SAA Print Manager takes advantage of this and processes output from OS/2 workstations on mainframe attached printers such as IBM 3800 laser printers. The options are endless, but still depend on the local environments.

### 5.2.1 Network Printer Objects

The network environment is probably the most frequent use of logical connections and redirected ports. With this in mind OS/2 Version 2.0 utilizes the LAN Independent feature of the Workplace Shell. This was discussed at length in Chapter 3 on the LAN environment but, simply put, the system now will take care of managing the logical interface between printers attached to servers and print jobs sent from the requestors to those printers without the need to issue NET USE or ASSIGN commands. Of course you still will have the flexibility to assign ports to printer objects for use by DOS or OS/2 non-PM applications, but even this can be handled through the Workplace Shell instead of issuing commands.

### 5.2.2 IBM 4033 LAN Connection

IBM provides the ability to have remote printers on a network that connect directly to the LAN without having to be physically attached to a print server. The IBM 4033 LAN Connection assigns logical LPT ports to the remote printers and installs software on an existing print server to manage them. Once their logical port assignments are assigned to a printer object on the server and an alias and access profile are defined they will appear in the Network folder of the Workplace Shell along with the other server printers. Printers attached to an IBM 4033 can also be accessed by the server as "local" printers without having the requestor or server code running.

### 5.2.3 Redirected Output to Non-standard Cards

There are a variety of very special printers and other devices on the market which require their own adapter cards and do not support the standard parallel or serial interfaces. The first IBM Personal Pageprinter, IBM 4216-020, is a good example.

This PostScript printer can only be connected to a very special adapter card, which holds 2MB of memory and has its own Motorola\*\* 68000 processor which runs the PostScript interpreter program and controls all the printer functions. Under DOS, this card is supported by its own adapter support program which emulates a parallel port. An application does not realize that it isn't "talking" to a real parallel port, but rather to a special adapter. Of course, under OS/2 this adapter support program doesn't do us any good. Since the card is not supported by the standard operating system, one has to buy an extra device driver and/or device monitor for it. This device driver runs on protection level 0 of OS/2 and can access this piece of hardware directly and exclusively. The device monitor can then hook into the operating system and intercept all data which is going to one of the parallel ports. Therefore, it can, like under DOS, emulate any of the three parallel ports. Such a solution is available from:

David Goodenough & Associates Ltd.  
283 City Road  
London, England

In some countries, this software may also be available from IBM directly. We have tested this software under OS/2 2.0 in a stand-alone environment and encountered no problems.

The above is just an example of what is possible. There are all kinds of different and "exotic" solutions on the market including a recent emergence of SCSI attached printers. But, as long as they cannot be connected through the standard parallel or serial interface, they must be supported by their own specialized device driver mechanism under OS/2. Those device drivers are usually loaded through the CONFIG.SYS file.

### 5.2.4 Automatic Emulation Switching (AES)

Another use of logical connections is to support the multiple emulation modes available in a single printer. Some printers can only be set in different modes by turning them off, changing switches and then turning them back on. Others, however, are capable of changing their emulation mode through software utilities provided by the printer manufacturer. Such is the case with the IBM 4216, 4019 and 4029 families of laser printers. These printers use a combination of physical and logical ports with redirection to accomplish the task of automatically switching from one mode to another based on the data being sent.

The OS/2 V2.0 printer drivers also support the Set Initial Conditions (SIC) code that can be placed in the printer data stream. This code allows for AES from PM applications *without* having to install any additional utilities. Printing from WIN-OS/2, however, would still need the utilities installed.

---

## 5.3 Pooled and Shared Connections

With the availability of OS/2 Version 2.0 comes a very powerful and flexible way of managing multiple printers with multiple definitions. The ability to assign multiple printers (ports) to a single printer object is called **pooling**. The ability to assign multiple printer objects to a single printer (port) is called **sharing**.

### 5.3.1 Printer Object with Multiple Ports (Pooling)

It is not uncommon to find several identically configured printers attached to the same print server on a network or an individual workstation. This happens as demand for the printers increases and is usually managed by assigning certain printers to certain users or applications. Of course the ideal setup would be for the system to *look* at the printers attached and print to one that isn't currently printing. This is what pooling will do for you. By creating *one* printer object and assigning it to *all* of the ports that have the identically configured printers attached, the system will direct the print job to an available (not busy) printer.

To set up a printer object for pooling:

1. Open the printer object settings and select the **Output** tab.
2. Either drag the pointer across the desired ports while holding down mouse button one or, hold the Ctrl key while clicking on the desired ports with mouse button one. Note that clicking on a port already selected will deselect that port.
3. Close the printer object settings.

#### Note

Identical simply means that the printers use the same printer driver with the same settings. This means you could have an IBM Proprinter XL III and an IBM 4072 ExecJet printer in Proprinter emulation mode pooled by using the Proprinter driver (IBM42XX).

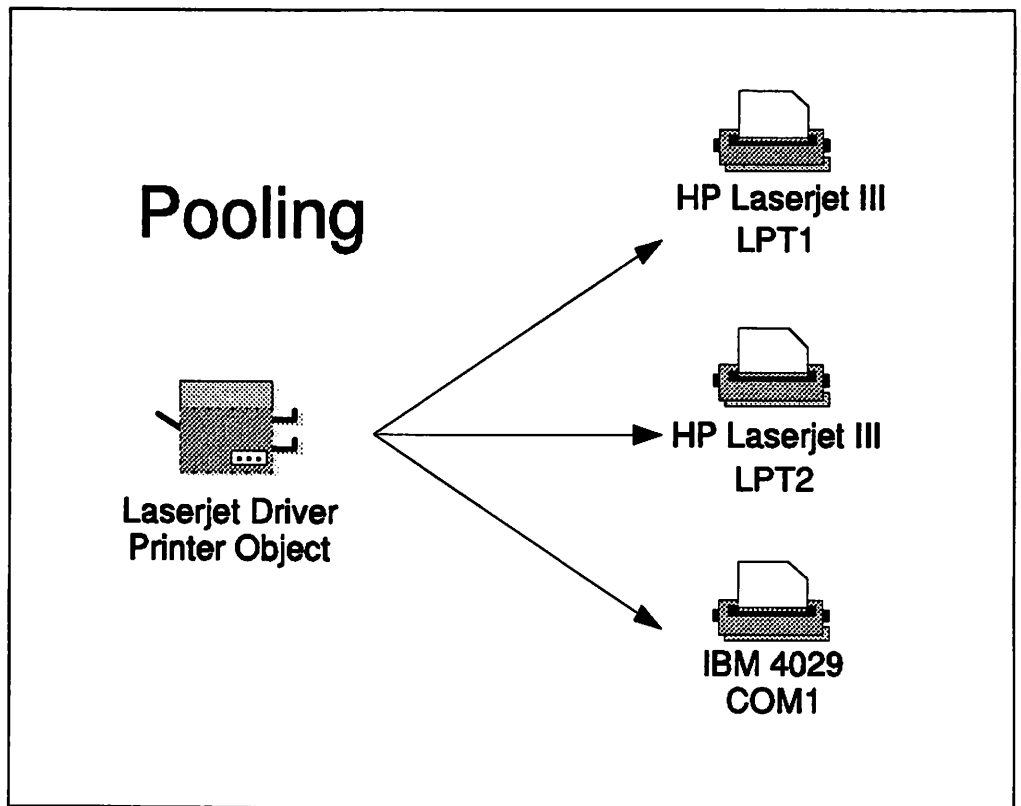


Figure 61. Pooling Three Printers that Use the Same Print Driver

In our testing we pooled two 4029/10L's and one 4029/10 in the following configurations:

1. LPT1 - 4029/10L  
LPT2 - 4029/10L
2. LPT1 - 4029/10L  
COM1 - 4029/10L
3. LPT1 - 4029/10L  
LPT2 - 4029/10L  
LPT3 - 4029/10

We then sent a print job from DeScribe to the printer object and in a separate test did a drag and drop of a text file and found that the printer selected to print next falls into a definite pattern. If you envision LPT1 through LPT3 and COM1 through COM4 as a list from top to bottom, when *all printers* are ready to print, the port *lowest* on the list receives *twice* as many print jobs as the other(s). To help visualize this consider the following test data:

Table 5. Sequence of Printer Port Selection by System Pooling		
Configuration 1	Configuration 2	Configuration 3
LPT2	COM1	LPT3
LPT1	LPT1	LPT2
LPT2	COM1	LPT3
LPT2	COM1	LPT1
LPT1	LPT1	LPT3
LPT2	COM1	LPT2
LPT2	COM1	LPT3
LPT1	LPT1	LPT2 (LPT3 Busy)
LPT2 (LPT1 Busy)	COM1 (LPT1 Busy)	LPT1 (3 & 2 Busy)
LPT2	COM1	LPT3
LPT1	LPT1	LPT2
LPT2	COM1	LPT3
LPT1 (LPT2 Busy)	LPT1 (COM1 Busy)	LPT1
LPT2	COM1	LPT3
LPT1	LPT1	LPT2
LPT2	COM1	LPT3
LPT2	COM1	
LPT1	LPT1	

**Note:** With two printers pooled 66% of the print jobs were sent to the same printer. With three printers pooled 50%.

This pattern is not a desirable one and should be fixed in later releases of OS/2. This pattern is important when one considers the following scenarios:

1. You want to put a primary printer on LPT1 and then a secondary printer on COM1. This would leave you with LPT2 and LPT3 free for parallel only printers. Based on the test results, however, 66% of the print jobs could end up on COM1 which is slower and less desirable.
2. You have an older, slower PostScript printer and a brand new one. Using LPT1 and COM1 as above would prove disastrous; however, you could use LPT1 and LPT2 with the newer printer on LPT2. Still, 33% of the jobs could end up on the older printer *even if the newer printer is available for printing!*

In the final analysis, if your queues are continually filled with print jobs then the concept and implementation of pooling will work quite well as the next available printer will be used. But if your print jobs are scattered then it would be better if you assigned specific ports to your print objects and instructed the users which ones to use for which type (size) of job.

### 5.3.2 Port with Multiple Printer Objects (Sharing)

When we think of printer sharing it is the ability to have multiple users accessing the same printer. Printer object sharing, however, is the ability to have multiple printer objects for one printer or, in other words, the ability for applications with various printer setup requirements to share the same printer without having to continually change or check the properties and settings of the printer. We will discuss three main scenarios but there are countless other combinations.

It should be noted that throughout this section we will be referring to printer object Job Properties and Printer Driver Settings. You should thoroughly understand their differences and function while reading this section. Printer Driver Settings allow you to describe the physical settings of a printer to the printer driver on a per port basis. If multiple printer objects use the same port and printer driver then they will have the same printer settings. Printer Object Job

Properties allow you to describe some settings individually for each printer object and are based on the default printer driver for that object.

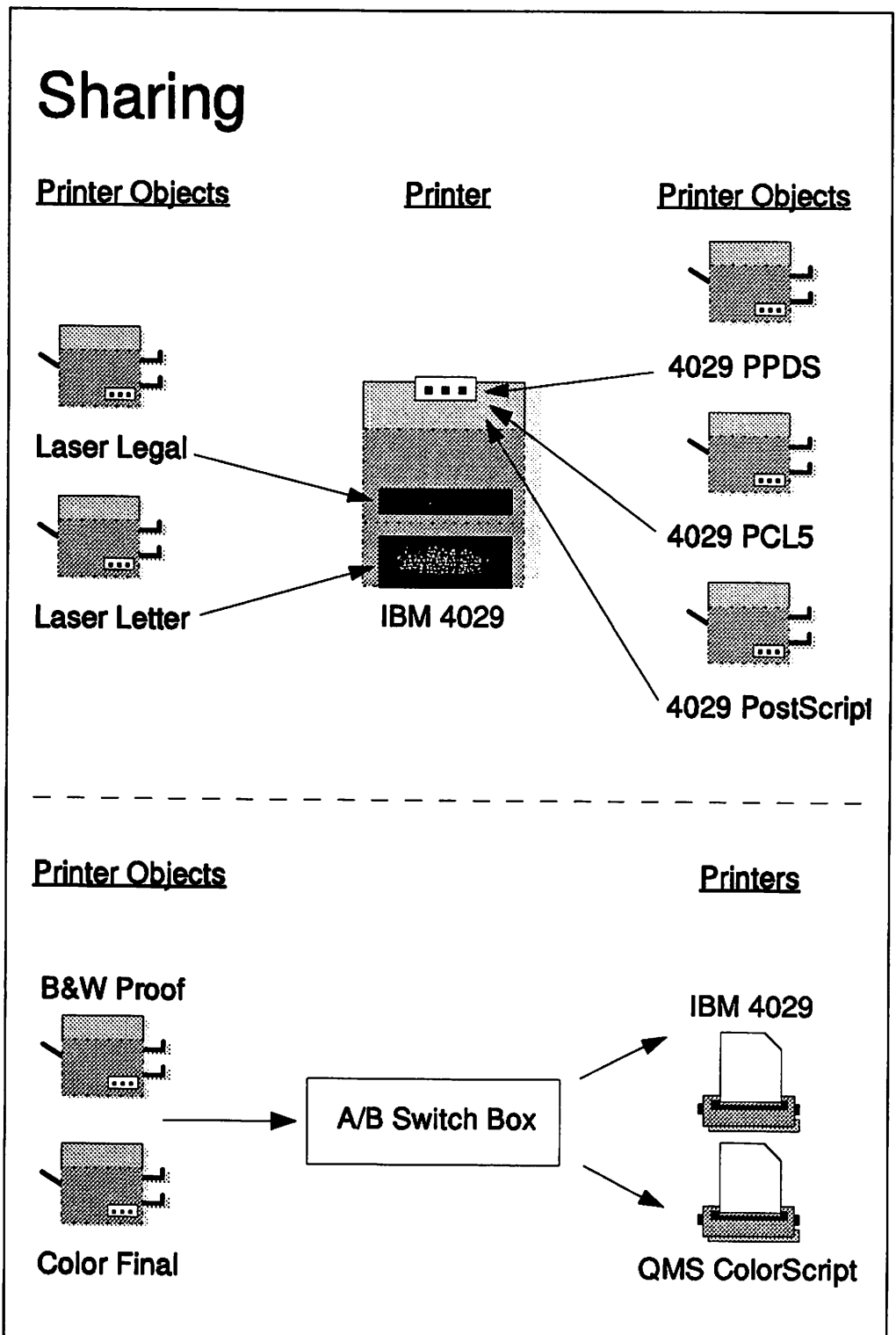


Figure 62. Some Possible Sharing Configurations

In the first scenario you have a printer with multiple input trays or paths such as the IBM 4019 and 4029 series of printers. The upper tray may have transparencies loaded while the lower tray has letter paper and the envelope feeder has envelopes. First create three printer objects and assign the same printer driver

and the same output port to each. Then open the Printer Driver Settings in *one* of the objects and assign the appropriate forms with the correct trays, as shown in Figure 64 on page 115. Then open the job properties of *each* object and assign the appropriate form to each object as shown in Figure 65 on page 116. The printer driver will map these to the appropriate trays and allow for uninterrupted printing from all available sources.

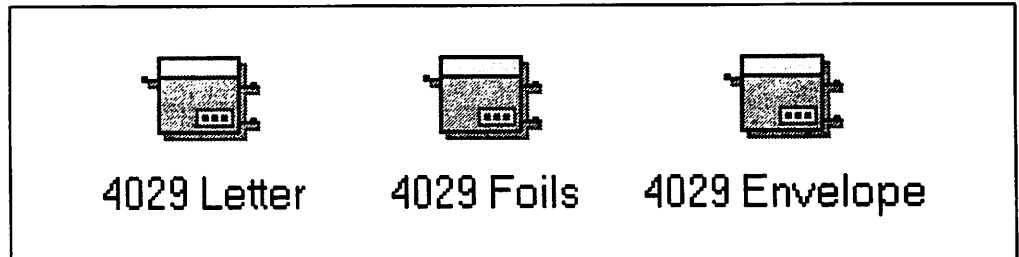


Figure 63. Scenario One, Printer Objects Created for Different Forms

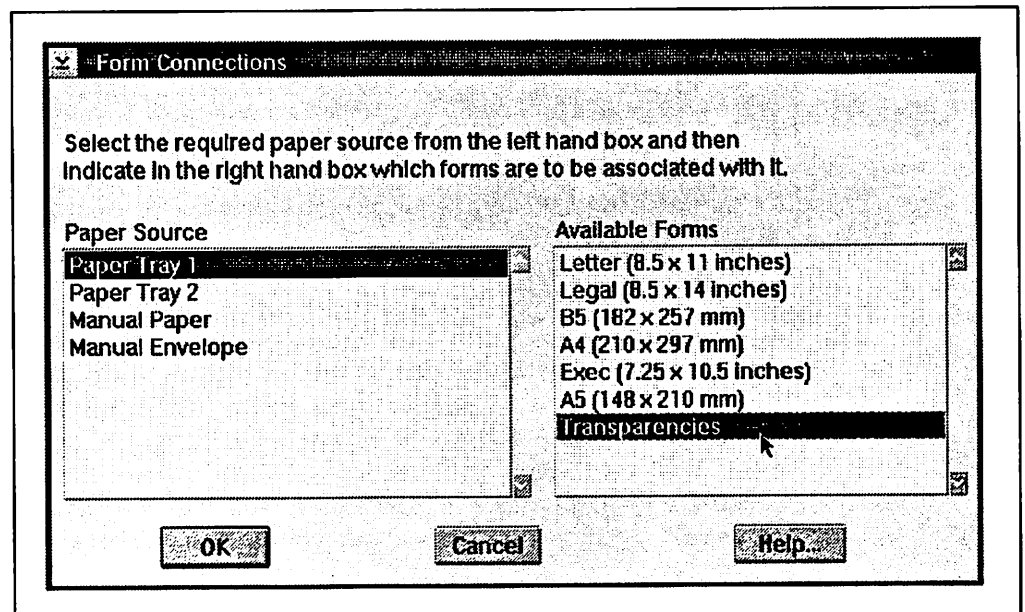


Figure 64. Scenario One, Assigning Source to Form in Printer Driver Settings



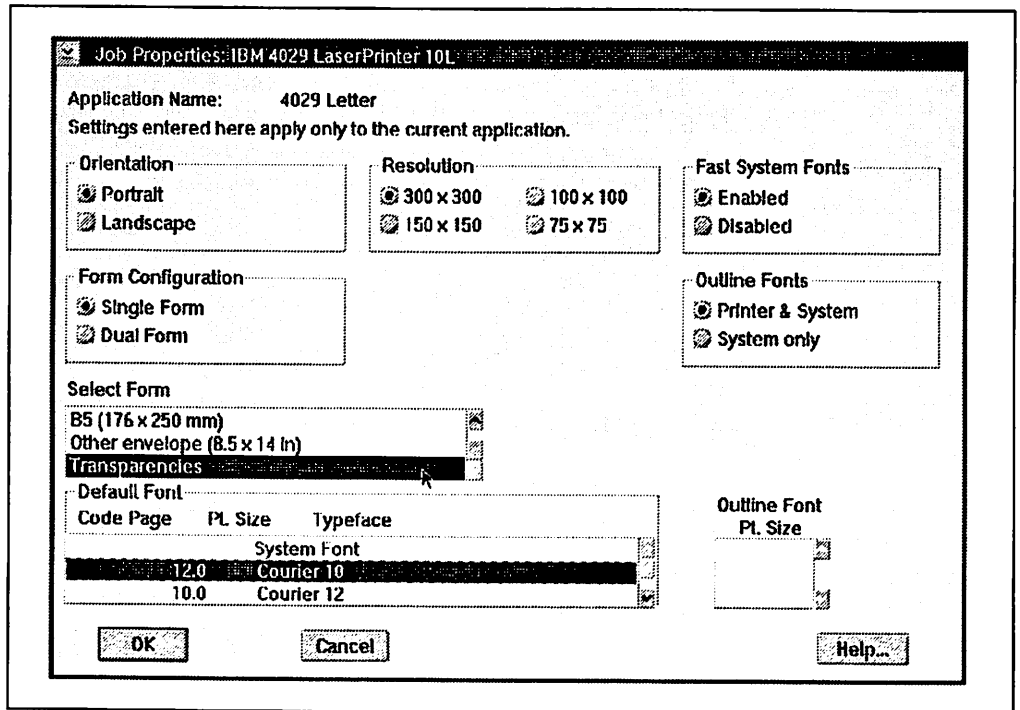


Figure 65. Scenario One, Assigning Form to Printer in Job Properties

In the second scenario your printer has only one input tray or path yet you would like to print on both letter and legal size paper. Since there can physically only be one size paper loaded at any time the printer driver settings will allow you to set only one as a default. In this case you would still create two printer objects and under job properties would assign one legal and the other letter. When you load the paper into the printer you have to tell it, through the printer driver settings which size is loaded. This will result in the print jobs from the printer object with that paper size being printed and the print jobs from the second printer object being held because of a "Forms Mismatch." You can also hold the queue for the second printer object and then release it when you change the paper and the printer driver settings, but if you forget to hold it the system will prevent those jobs from printing anyway.

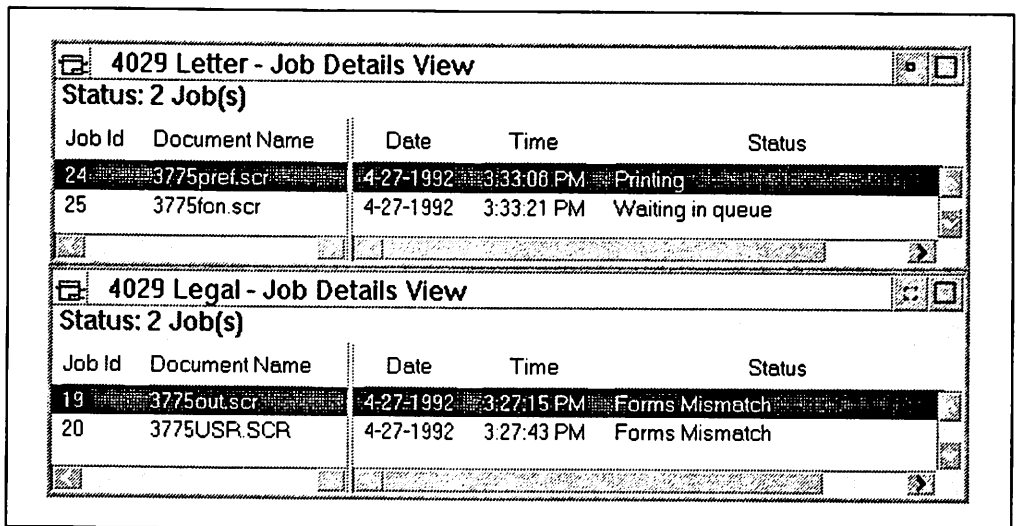


Figure 66. Second Scenario, Printer Object Queues (Details View)

In the third scenario you have a printer that emulates another printer(s). Let's take the case of a printer that emulates an HP Laserjet and has a PostScript engine. If your printer requires you to set switches in order to change the emulation mode then you would create two printer objects, assign them to the same physical port of the printer, and then assign each one their appropriate printer driver. You must always hold the queue of the printer object that the printer switches are not set to. To then print the jobs in the held queue you can hold the active queue, change the switches, then release the appropriate queue. Even if your printer *does* support AES through the printer drivers or software utilities you may want to consider the above scenario as you may want to hold the queues with bigger jobs for off-peak printing.

### 5.3.3 Multiple Printer Objects with Multiple Ports

You can combine the functions of pooling and sharing to create an endless variety of configurations. For example, you can have two printers each with two input trays. Both lower trays have letter paper while one upper tray has legal paper and the other has transparencies. You would create a printer object that pools the two printers and whose properties were set for letter paper. Then you would share that object with two more printer objects one of whose job properties is set for legal paper while the other is set for transparencies. Remember that you must have the proper forms configured in the printer driver settings in order to make this work.

---

## 5.4 To a File

There are many reasons to send output intended for a printer to a file. Distributing print files instead of data files to people who don't have your application, trying to debug or test a printer interface, or preparing a file to include in another document are among some of the reasons. But probably the most common is in the PostScript world. It is not uncommon to have a 300 dot per inch printer on your desktop for "proofing" and then you send your print file out to a typesetter for your "final" copy. To direct output to a file instead of the printer:

1. Open the printer object settings and select the **Output** tab
2. Click on the box next to the words **Output to file** and a check mark should appear
3. Close the printer object settings.

To direct output back to the printer follow the same steps, the check mark should disappear, and then select the desired port.

If you print to a file often, you might consider creating a separate printer object for this purpose. Also, some application programs allow you to select this option at print time.



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## Chapter 6. Printing from Applications

In *OS/2 Version 1.3 Volume 2: Print Subsystem* we detailed various applications with respect to their printing capabilities and options. Most of that information as well as the tips and techniques are still valid with OS/2 V2.0. We would now like to concentrate on some of the questions that have been generated based on the increased function in OS/2 V2.0 and its supported applications. OS/2 V2.0 introduces the functions of sharing, pooling, WIN-OS/2, graphical print screen capabilities, and much more. With the ability to define printer objects and install fonts in almost unimaginable combinations the current problems most people face can be summed up in three questions:

- Where's my printer? (or why is that printer still there?)
- Where's my font? (or why is that font still there?)
- Where's my print-out? (or WHERE'S MY @#!% PRINT-OUT!?).

We will attempt to answer the first two questions by showing you how different applications generate their printer and font lists. The third question is more abstract so we will address it first as it has close ties to the previous chapters on printer configuration and management.

---

### 6.1 Where's My Print Out?

There are two scenarios possible:

- Your job didn't print
- Your job printed but you don't know where.

#### 6.1.1 Finding Your Print Out

It is usually in a network environment where print-outs tend to disappear. When you have scattered print servers and LAN printers directly connected to any outlet the task of informing the user where their job is waiting for them is an exercise in organization. There are two common sense things that you can do:

- Use a well defined separator page with a highly visible user ID
- Use the messenger service of the network to display the server name, device name and output port that the job was sent to.

If you construct your server and device names with a little logic you should be able to include room or floor information in the messages.

To provide faster throughput and greater flexibility OS/2 has a feature called "pooling." This feature allows you to access multiple printers from the same printer object (queue). This also adds another layer of search as you may now have multiple identical printers in the same room and your job just printed on the one that was "available."

### 6.1.1.1 Finding Your Output Using the Network Message

The following figure shows the message that LAN Server displays on the requester that sent the print job. There are four (4) key pieces of information that are based on the printer installation. In our example they are the server name (ITSCPRT1), the queue name (A4DRAFT), the device name (DRAFTB&W) and the port it is attached to (LPT1).

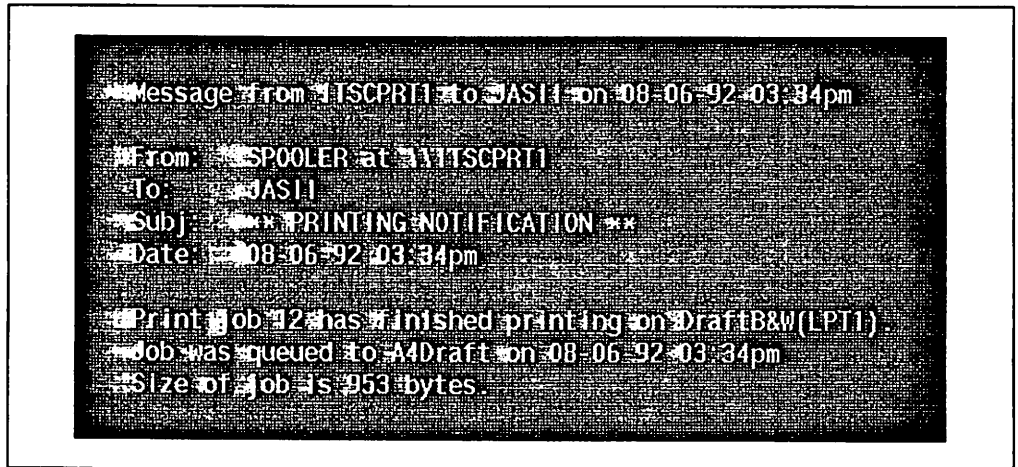


Figure 67. LAN Server Print Confirmation Message

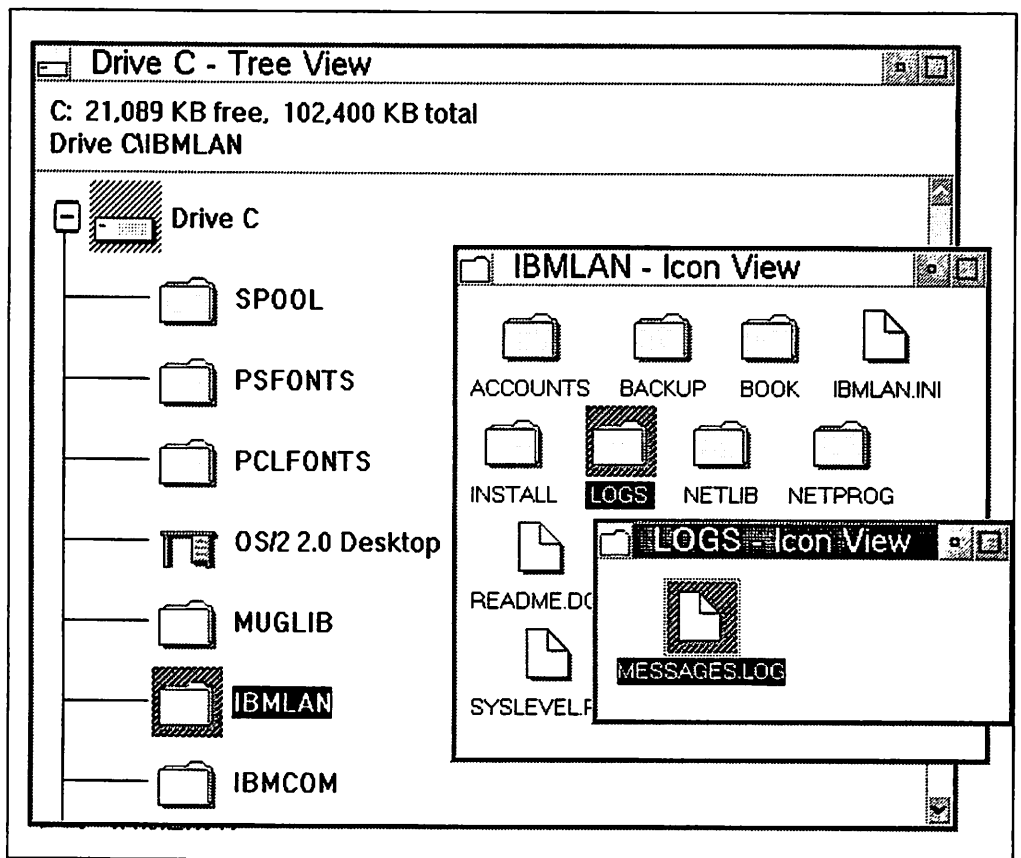


Figure 68. Location of LAN Server Message Log File

Again probably the most complex situation will be with pooled printers. In this case, since the printers share the same queue, it is the LPTx port information that is the only clue as to where your job printed. In our test we had another

initial printer object assigned to LPT1 and LPT2 called DRAFT B&W. As you can see in the following figure the system named our printers based on this first printer object that was established. As this naming convention could become confusing, in the case of pooled printers, it would then be wise to label the printers in the room with their assigned LPTx ports.

The second problem you may encounter is that the message stays on the requester for only about 30 seconds. If you are not at the requester when it is displayed you may miss it. If you want to retrieve the message the system stores it in a log file located in \IBMLAN\LOGS\MESSAGES.LOG.

If you double click on the MESSAGES.LOG icon the messages will display in the system editor. New messages are appended to the end of the file so you will have to scroll to the end to see the latest messages. Notice we have shadowed our MESSAGES.LOG into another folder to allow for easier access.

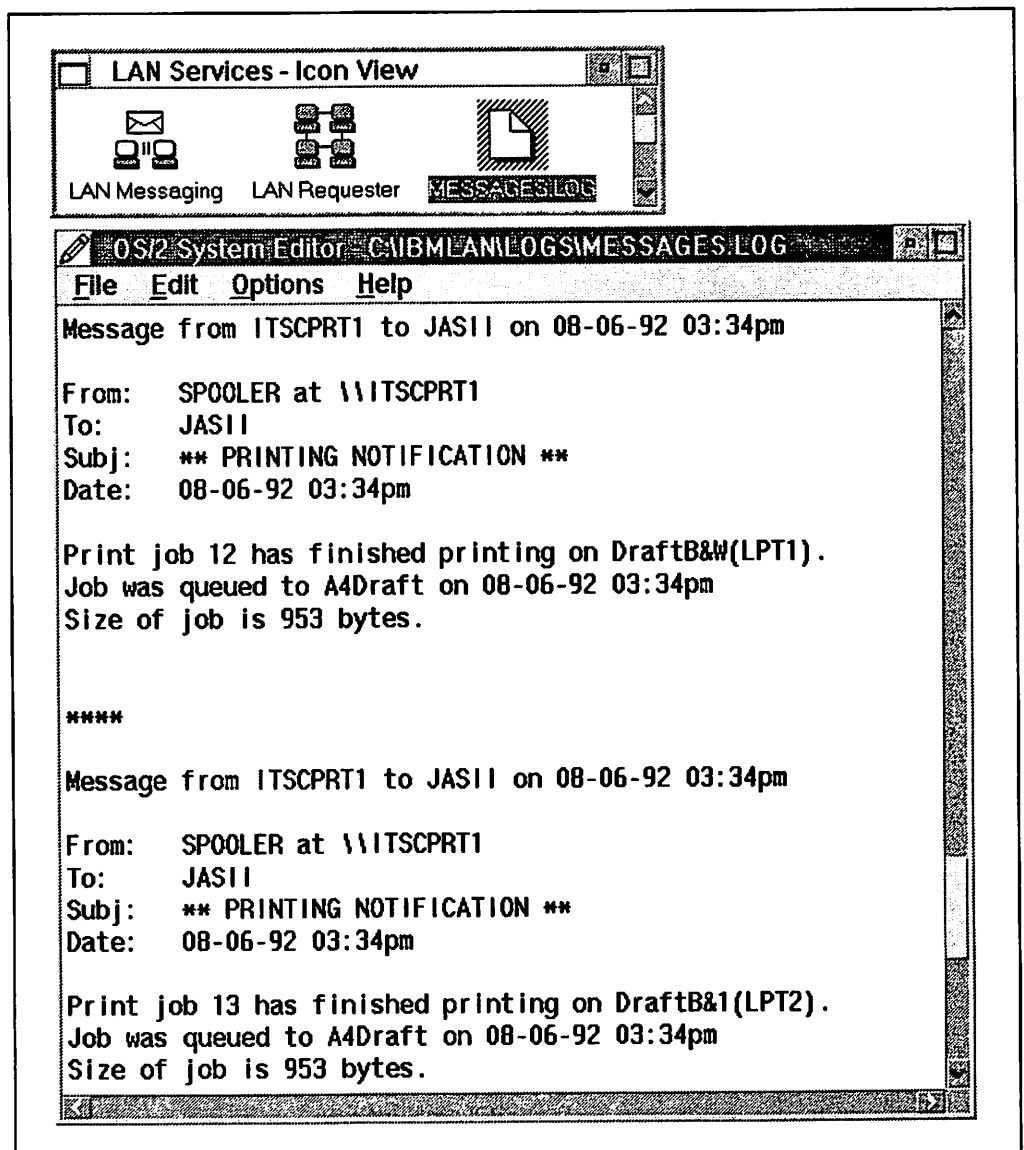


Figure 69. LAN Server Message Log File

### 6.1.1.2 Finding Your Output from the Default Printer

Some applications have the capability to print but offer no selection of printers. An example of this is CorelDraw! 2.0 for OS/2. In the case of PM applications and PM print screens, these jobs are sent to the default printer. In full screen DOS or OS/2 sessions, applications may have a setup for printers when you install them or they may just default to LPT1. In either case, knowing the default printer and the printer that is known as LPT1 can help you to locate your job. The following figure shows you how to find out which printer is the default for the Workplace Shell. You can change this setting by displaying this menu and clicking on the desired printer.

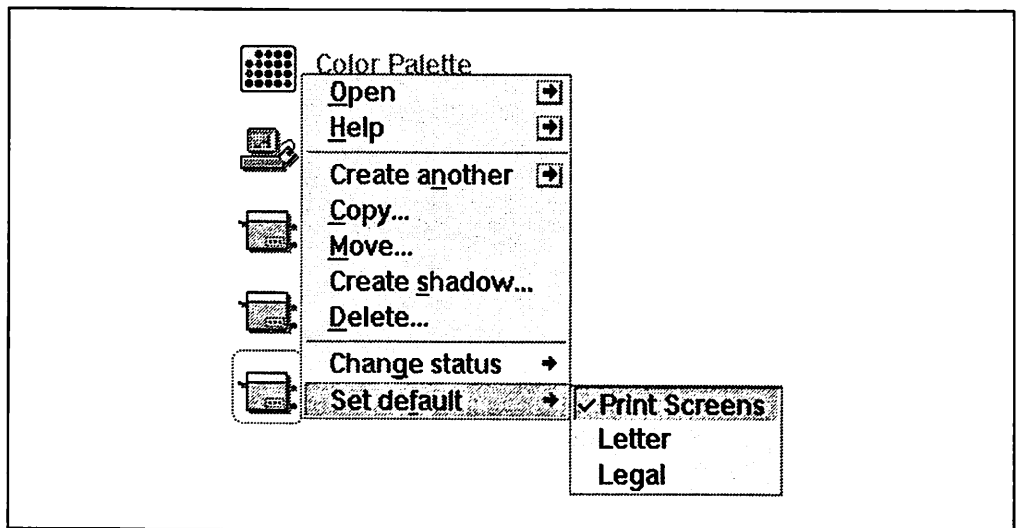


Figure 70. Displaying/Changing the Default Printer for the Workplace Shell

### 6.1.2 Finding Out Why It Didn't Print

The assumption for this section is that your application is sending the correct information to the printer subsystem in the correct format. Some applications prefer to write their own printer specific code instead of letting the printer driver write it. This is most prevalent in the PostScript world. If the code is not "clean" then it will print inaccurately or not at all. In this situation you need to work with the application developer to determine the problem. We are going to focus on configuration issues. The situations where you send a print job to a printer object or destination and nothing or "garbage" comes out.

There are two scenarios that can give you the appearance of printing only to end up without your desired print job in hand:

1. The printer object settings have been inadvertently changed with respect to output ports or printer driver assigned, or
2. The printer in your application list doesn't exist any more.

In Chapter 2, "User Perspective" on page 3 we showed you how to configure a printer object. We also warned you of some of the potential problems that might occur if you were not careful while doing your configurations. With respect to "disappearing" print jobs, the output page and the printer driver page of the printer object may have the answer.

### **6.1.2.1 Output Port Page**

Because you can configure all of the output ports from this page the port selected may not be the port desired. This can happen if you double click on one of the ports to change its settings. This is a valid action that you can perform but will result in that port also being assigned to the printer object you are in. The printer port selected may either be connected to a printer that does not support the printer driver for this object or the port may not exist or have a printer attached to it. In either case the print job will be sent to the queue and the system will send the job to the selected port whether it exists or not. The result is normally no error and no print-out.

### **6.1.2.2 Printer Driver Page**

Because you can configure any of the installed printer drivers from this page the default printer driver selected may not be the printer driver desired. This can happen if you double click on one of the printer drivers in the **Printer driver** container to change its settings. This is a valid action that you can perform but will result in that printer driver also being assigned as the **Default printer** driver for the printer object you are in. The printer port selected may either be connected to a printer that does not support the printer driver for this object or the port may not exist or have a printer attached to it. In either case the print job will be created by the printer driver and sent to the printer object. The system will then send the job to the printer and if the printer does not support that data stream then the result is normally no error and no print-out.

### **6.1.2.3 Non-existent Printer**

In the case of network printers, you may have a printer object listed in your applications that no longer exists. This is because when you initialized the network printer object entries are made in the \*.INI files on your system. For more details on this scenario see 6.3.1, "Where Is the Printer I Just Installed?" on page 142.

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## **6.2 Application and System Font Lists**

For this section we used Berthold Bodoni Regular from the Adobe Type Library in two different formats. The first format is the Type 1 format using the .AFM and .PFB files. For the second format we generated six point sizes of .SFP fonts for the LaserJet by using the font utility that ships with the font from Adobe. The following section maps how the system and various applications handle these additional fonts.

### **6.2.1 Where Is the Font I Just Installed?**

There are several places to install additional fonts for printing. The Font Palette for PM and the Adobe Control Panel for WIN-OS/2 install fonts that can be used system wide. Some printer drivers also have the ability to install fonts that can be used when a printer using that printer driver is selected for output. Depending on the application, font lists may automatically be updated or you may have to perform some additional steps to use the additional fonts. This section will show you examples of how different applications handle additional fonts.



### 6.2.1.1 System-Wide Fonts

The OS/2 V2.0 Font Palette allows you to install additional fonts that can be used by OS/2 PM to output to screens and printers. After adding fonts to the palette, however, you will not see the new fonts in the font list. In Chapter 4, "Fonts" on page 71 we emphasized that this program does not refresh its font list until you close the Edit font dialog and then reopen it. The following series of figures illustrates this.

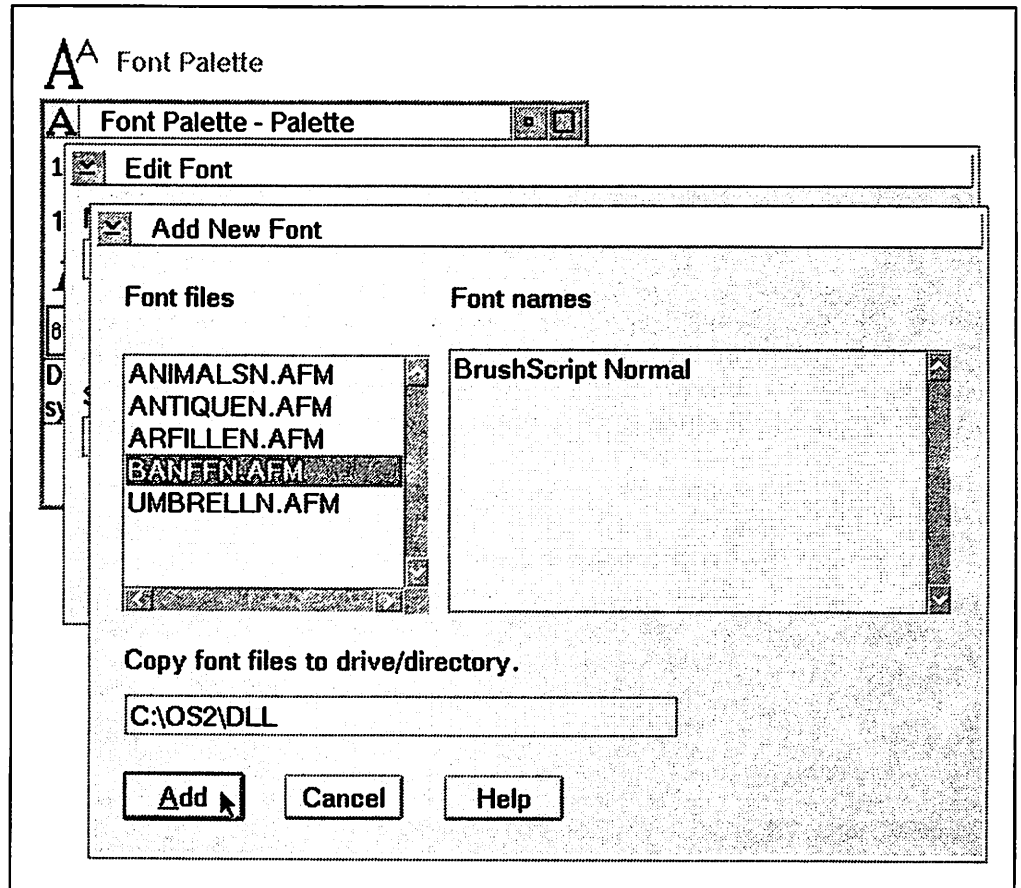


Figure 71. Adding a Font to the Font Palette

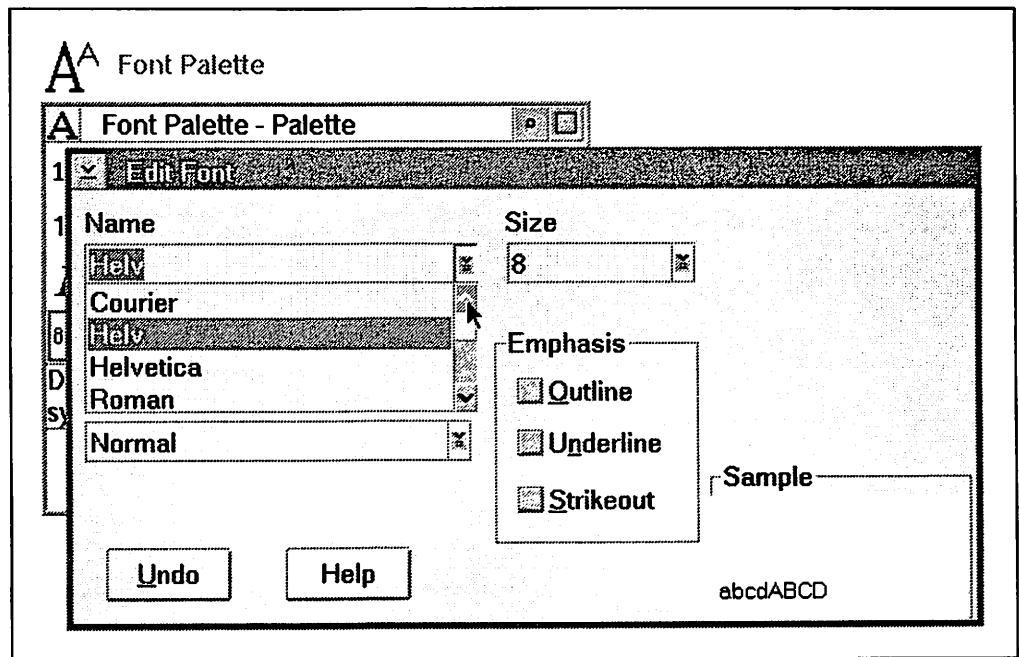


Figure 72. Font List Immediately after Add

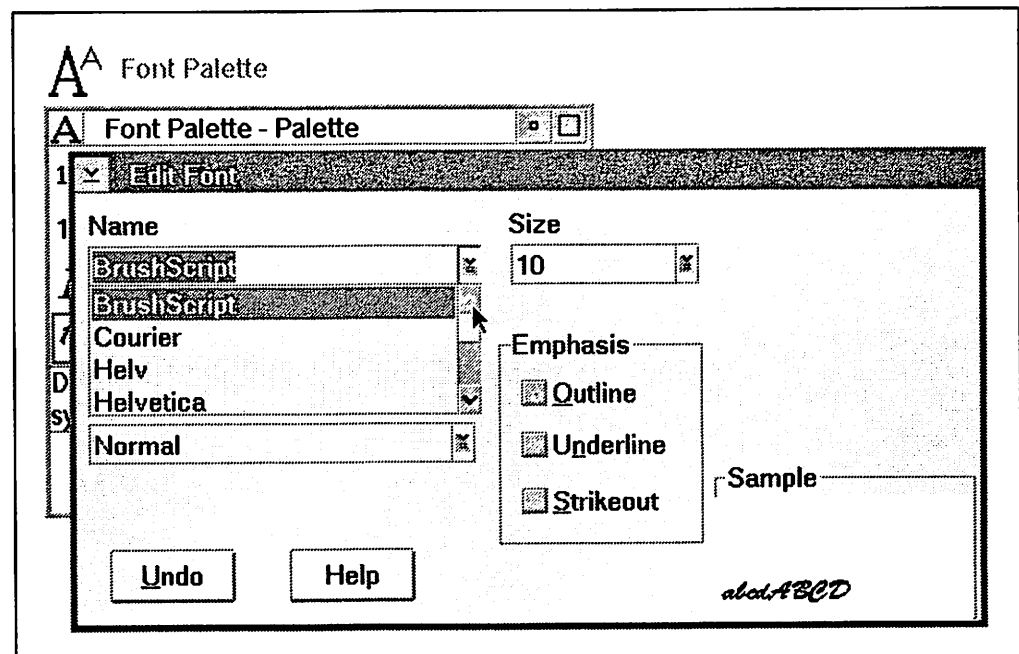


Figure 73. Font List after Closing and Reopening Edit Dialog

The WIN-OS/2 ATM Control Panel allows you to install additional fonts that can be used by WIN-OS/2 to output to screens and printers. After adding fonts to ATM you will see the new fonts in the font list of ATM but not in any of the applications. In Chapter 4, "Fonts" on page 71 we emphasized that WIN-OS/2 can not use the additional fonts until you restart it. We also mentioned that the system will prompt you to do this as shown in the following figure.

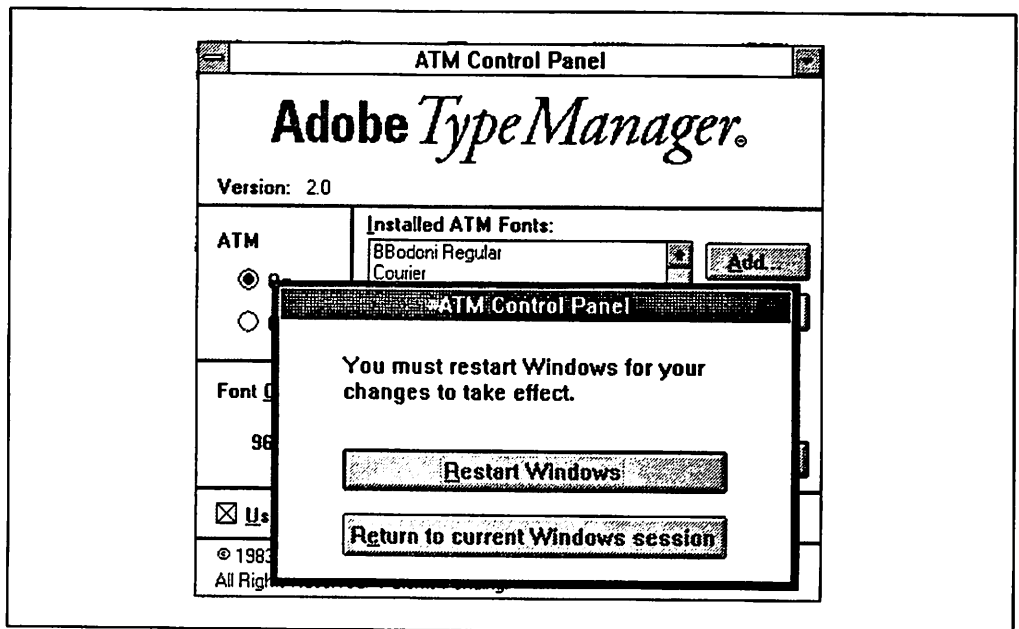


Figure 74. WIN-OS/2 Prompt after Installing a Font in the ATM Control Panel

### 6.2.1.2 Printer Drivers

As we mentioned some printer drivers allow you to install additional fonts that are specific to only that printer. Unlike the addition of fonts in the Font Palette and the ATM Control Panel, fonts installed in the printer drivers were immediately available to the applications when the appropriate printer was selected for output. Even though we did not encounter the "where is the font I just installed" scenario, we are including this section to show you how we built our test environment. The following figures show an example of adding the Bodoni Regular .SFP files to the LaserJet printer drivers in both OS/2 PM and WIN-OS/2.

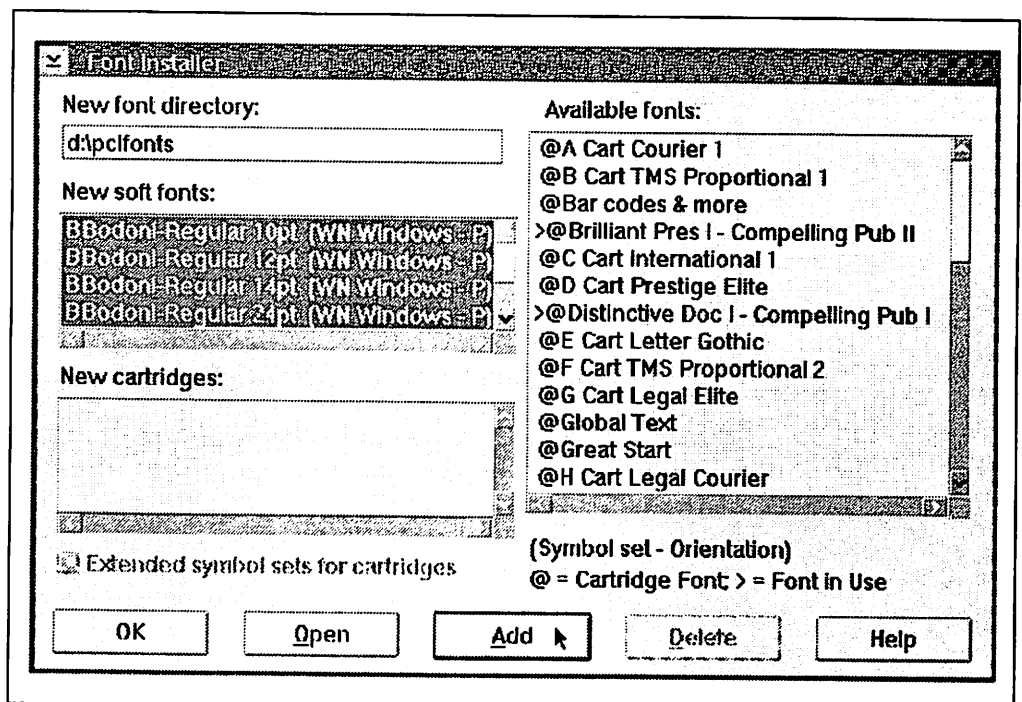


Figure 75. Adding Printer Fonts in LaserJet Driver in Letter Printer Object

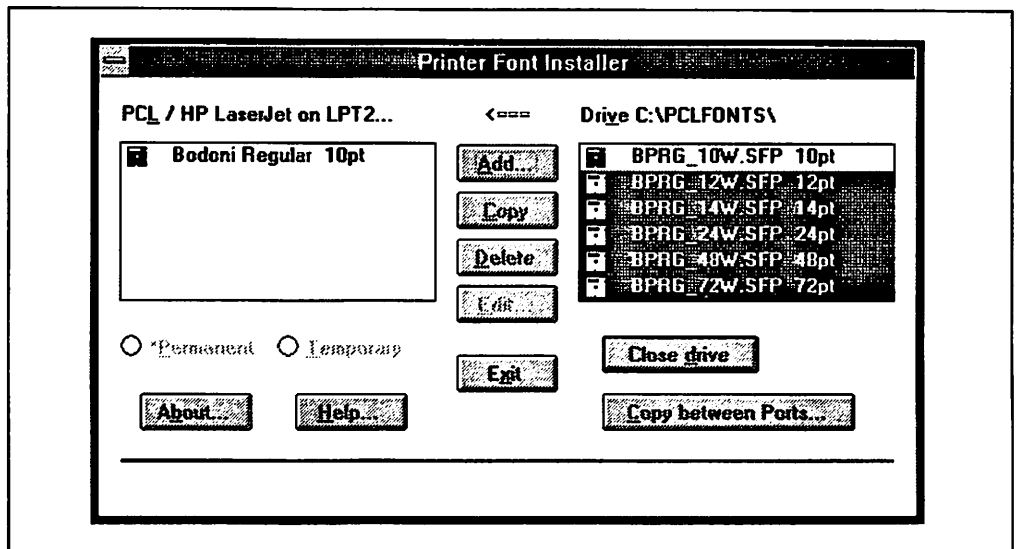


Figure 76. Adding Printer Fonts in LaserJet Driver in WIN-OS/2

### 6.2.1.3 Printer Driver Fonts in Applications

This section will show you what happened in different applications after we installed our test fonts in the printer drivers, the Font Palette and the ATM Control Panel in a variety of combinations. First we installed the fonts only in the printer drivers. The following figures show that DeScribe listed the font and only the point sizes we installed.

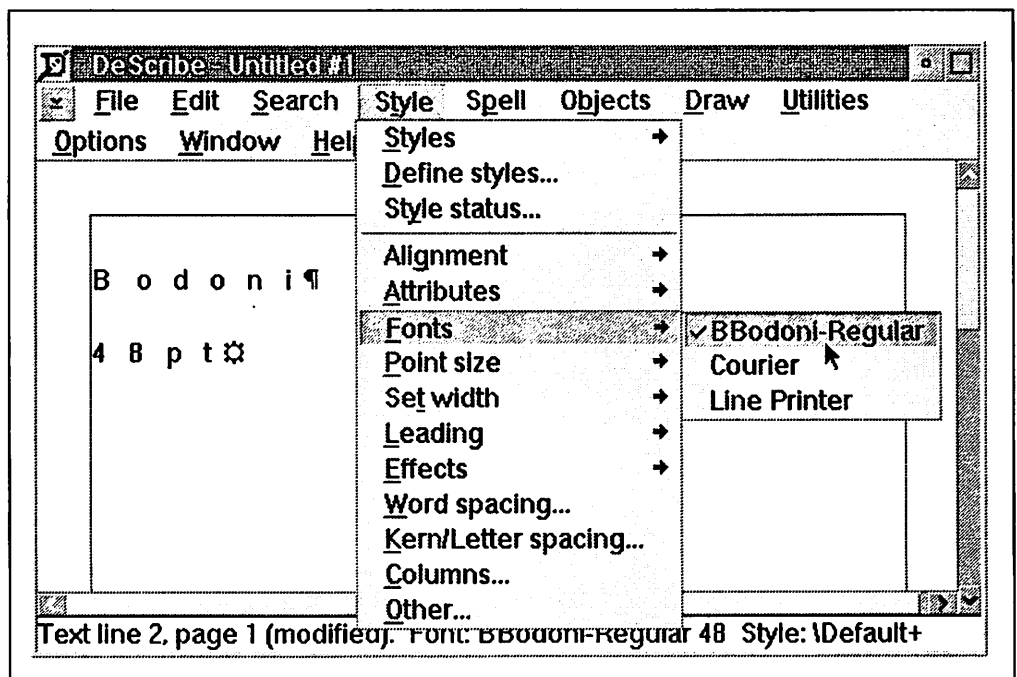


Figure 77. Font List in Describe after Adding Fonts in Printer Driver

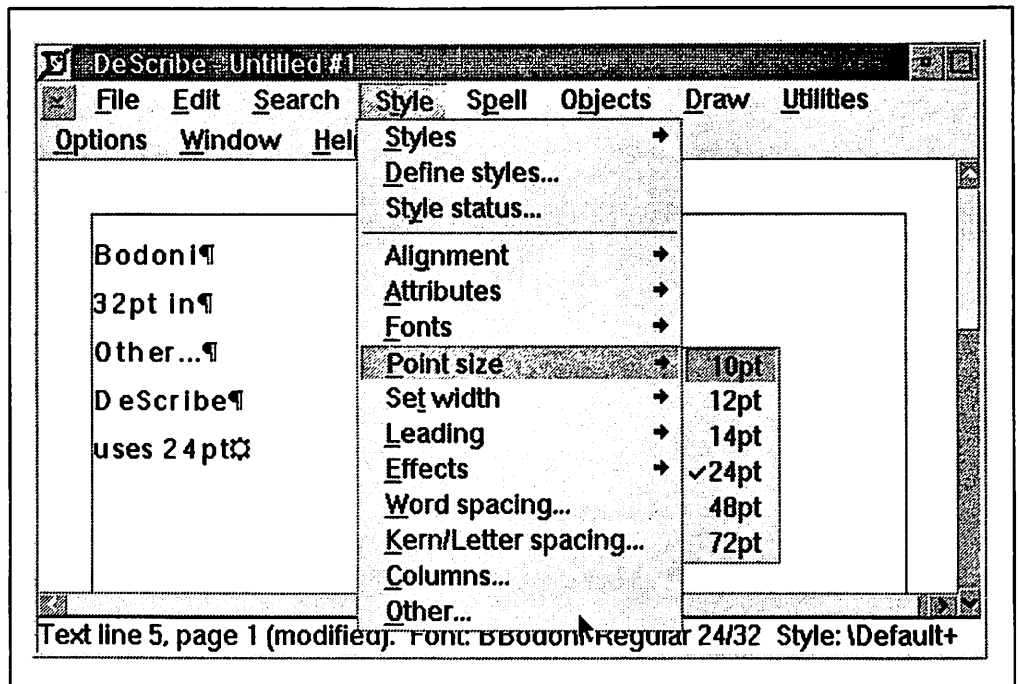


Figure 78. Point Sizes Available for Font Added in Printer Driver

The first thing to notice is that the font on the screen is not the font we installed. Since we did not have a screen font to install, DeScribe used the System Proportional screen font so that we would at least see something. The previous figure also shows an **Other...** option in the **Style** menu of DeScribe. This option allows you to enter a point size other than the ones listed. When we tried to use a point size we had not installed (32pt) DeScribe displayed the next closest size that we did install (24pt) but used the 32pt selection as the basis for the line spacing. When we printed the text we got Bodoni Regular in 24pt type with 32pt spacing.

The next application we opened was Lotus 1-2-3/G. The following figure shows the font setup dialog and its font list. The installed font does not appear because Lotus sets up *pairs* of fonts for the screen and the printer. In this case this is desirable as we do not have a screen font installed. In other words we get to choose which font we would like to see on the screen and then match it to the font that is installed for the printer driver. The displaying of these two font lists is controlled by the **Device** button.

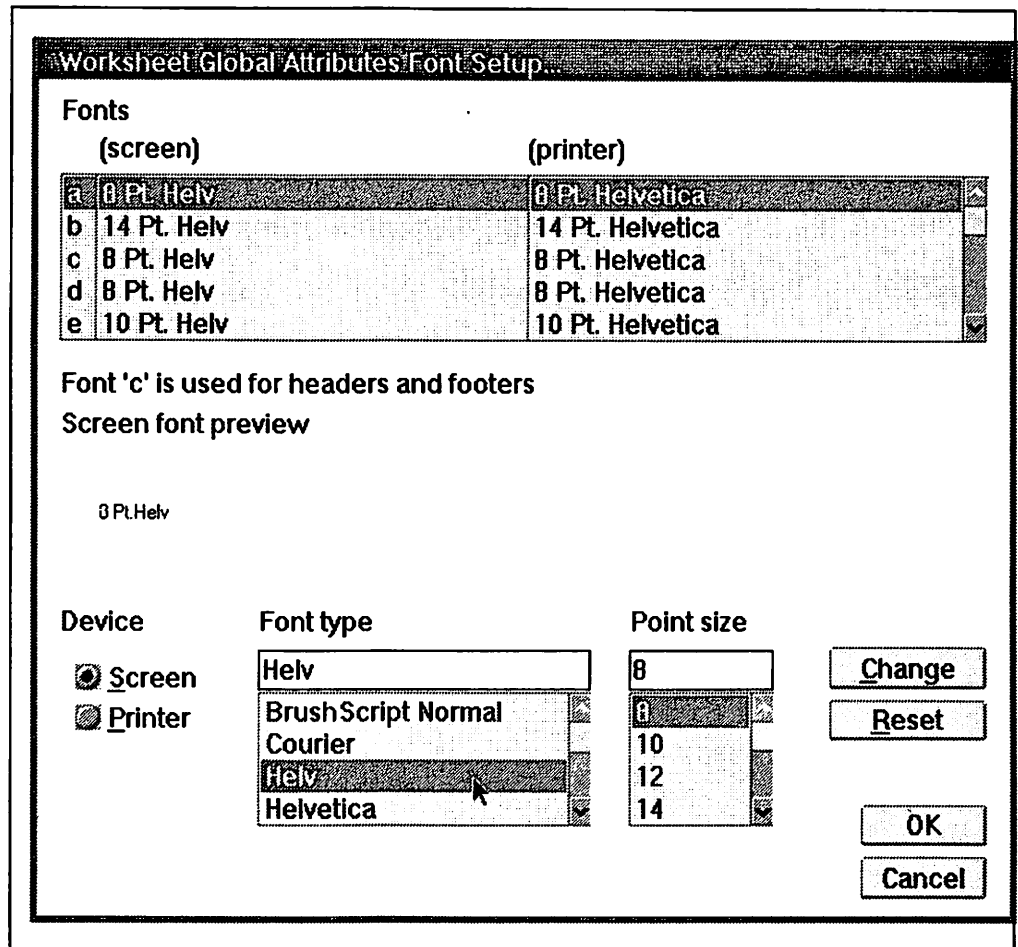


Figure 79. Screen Font List in Lotus after Adding Fonts in Printer Driver

By clicking on the **Printer** button in the following figure we see the font and the point sizes that were installed. Again we were able to specify a different point size like in DeScribe and again when we printed we got the closest installed point size with the point size specified line spacing.

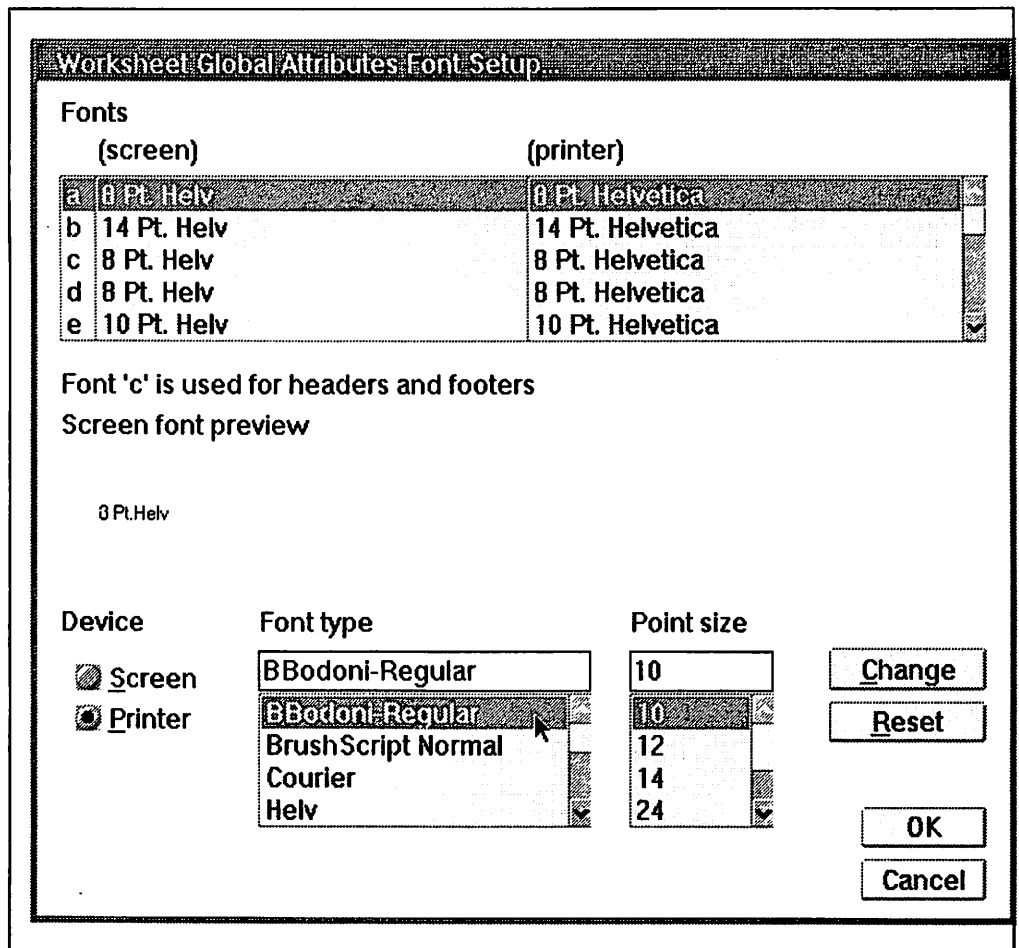


Figure 80. Printer Font List in Lotus after Adding Fonts in Printer Driver

Aldus PageMaker 4.0 for Windows presented a third approach to font lists. While the font was listed in the font list, the point sizes available were not limited to the installed sizes. PageMaker displays a generic list of sizes for any font in its list. This allowed us to select an uninstalled point size but with the same displayed and printed results we got in Lotus and DeScribe. The screen font displayed by WIN-OS/2 was determined when we installed the font in the printer driver. We were able to select among various generic screen font types such as Roman, Swiss, Courier and others. The next two figures show the PageMaker lists.

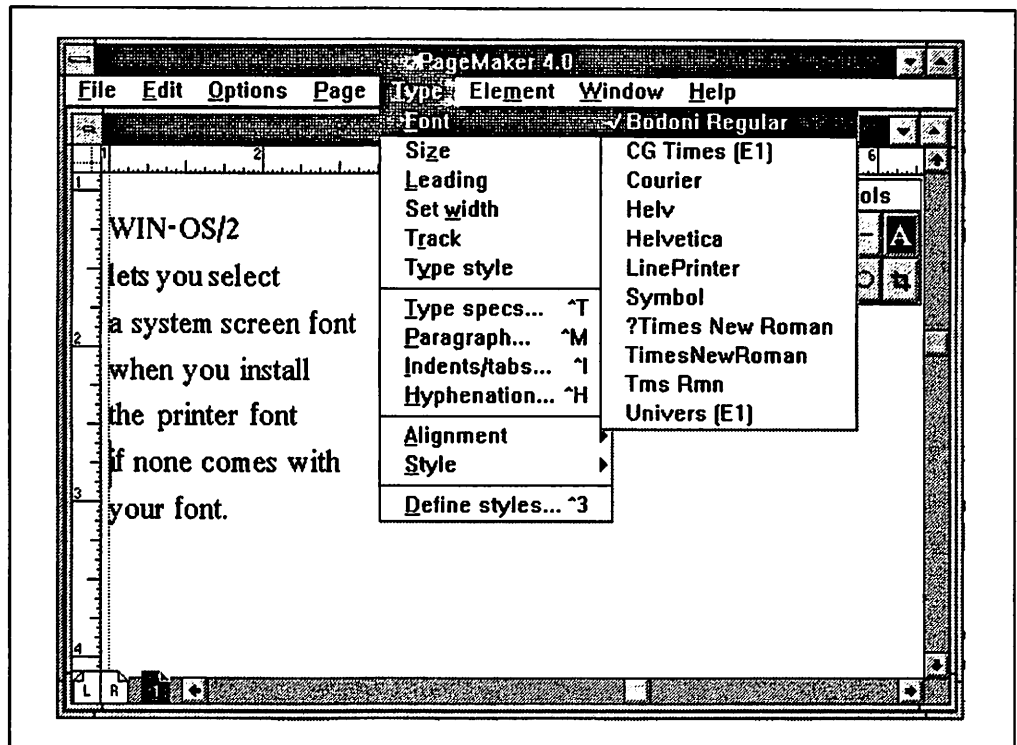


Figure 81. Font List in PageMaker after Adding Fonts in Printer Driver

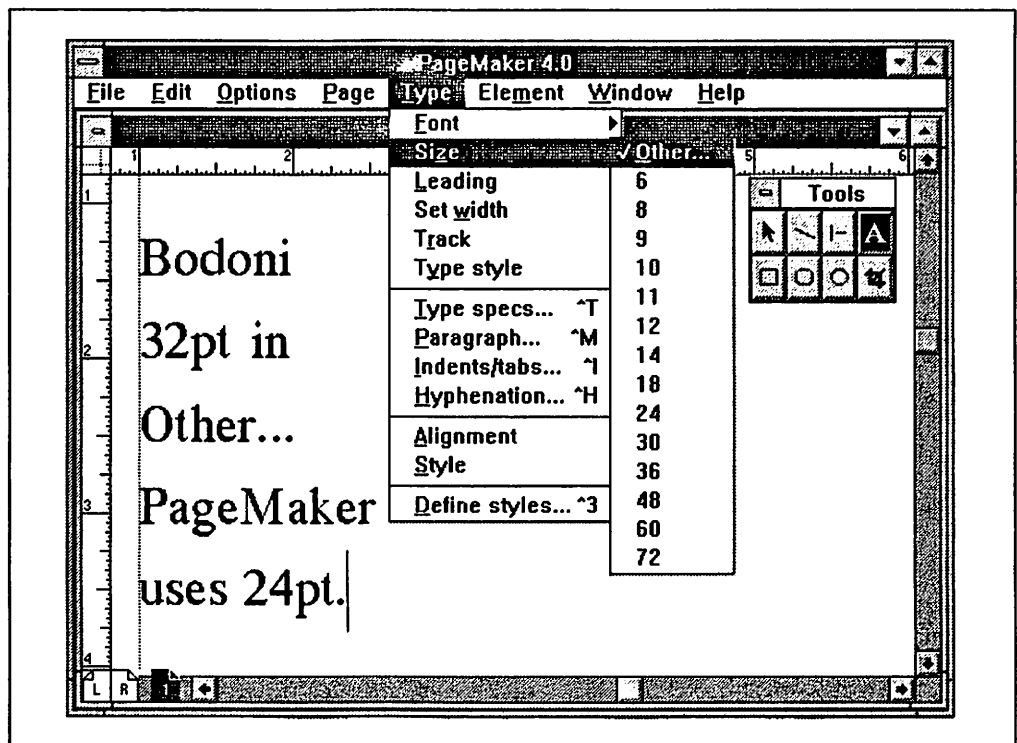


Figure 82. Point Size List in PageMaker after Adding Fonts in Printer Driver



#### 6.2.1.4 System-Wide Fonts in Applications

Next we installed the font in the **Font Palette** and the **ATM Control Panel** for WIN-OS/2. This install should now allow us to use the Bodoni Regular font in any point size we desire. When we opened DeScribe and displayed the font size list we saw the same list that is shown in Figure 77 on page 127. Another step is required in DeScribe to access the other point sizes. In the **Printer Setup** dialog of DeScribe is a check box labeled **Printer Fonts**. Since we installed this font in the **Font Palette** and not the printer driver, DeScribe will only use it if we remove the check from this box. This is shown in the following figure.

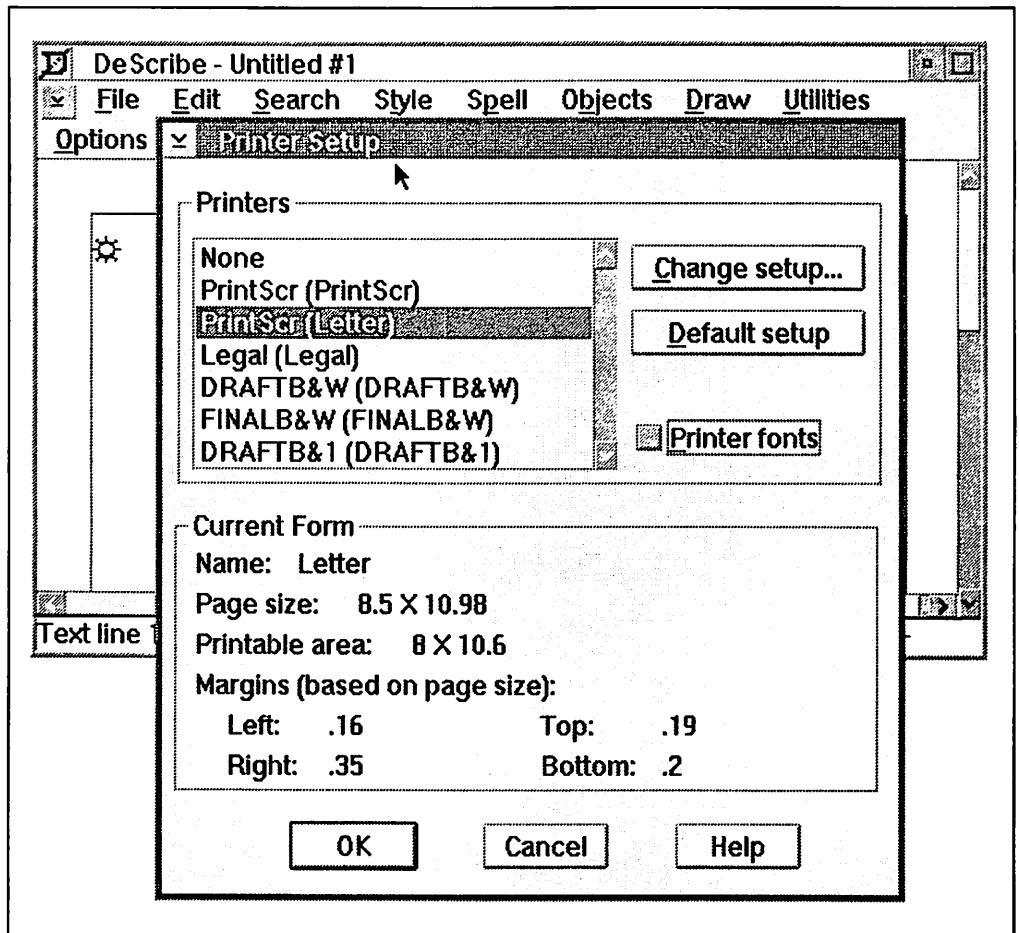


Figure 83. Selecting All Available Fonts in DeScribe

The next figure should be compared with Figure 77 on page 127. You will notice that, in addition to Bodoni Regular, all of the fonts that are installed in the **Font Palette** are listed. Even if we had not installed any additional fonts by removing the check mark we are able to use the core fonts that were installed by OS/2 V2.0.

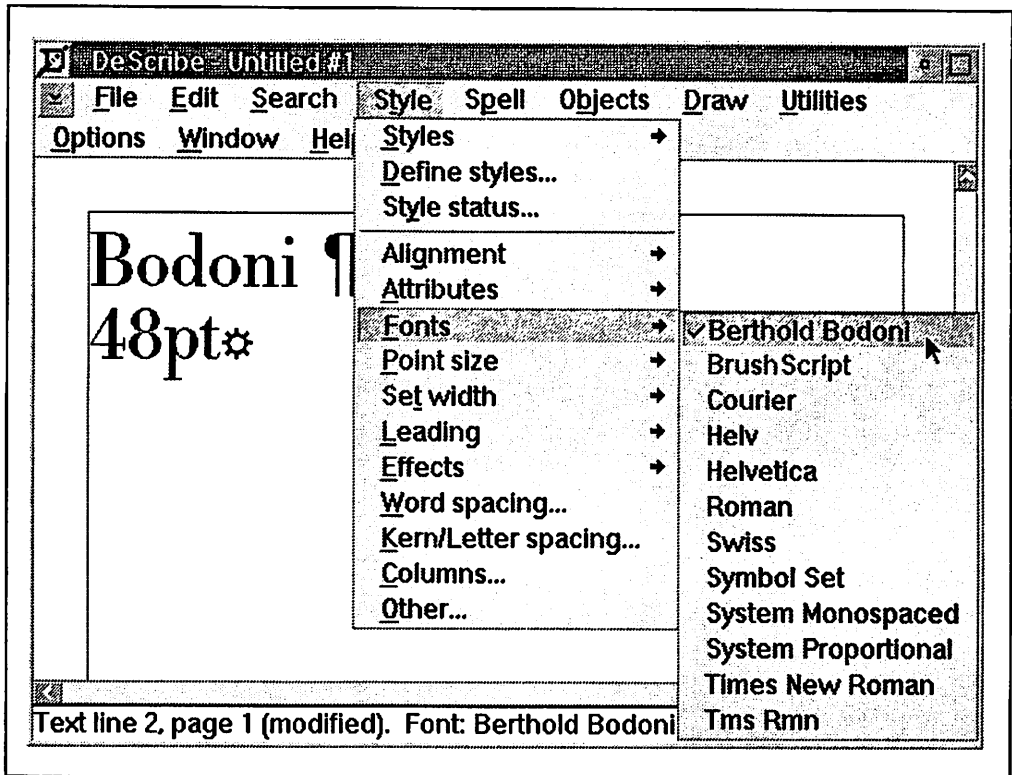


Figure 84. Font List in Describe after Removing Printer Fonts Check

The next figure should be compared with Figure 78 on page 128. You will notice that the available point size list has expanded and if you enter an **Other...** point size it will be displayed and printed.

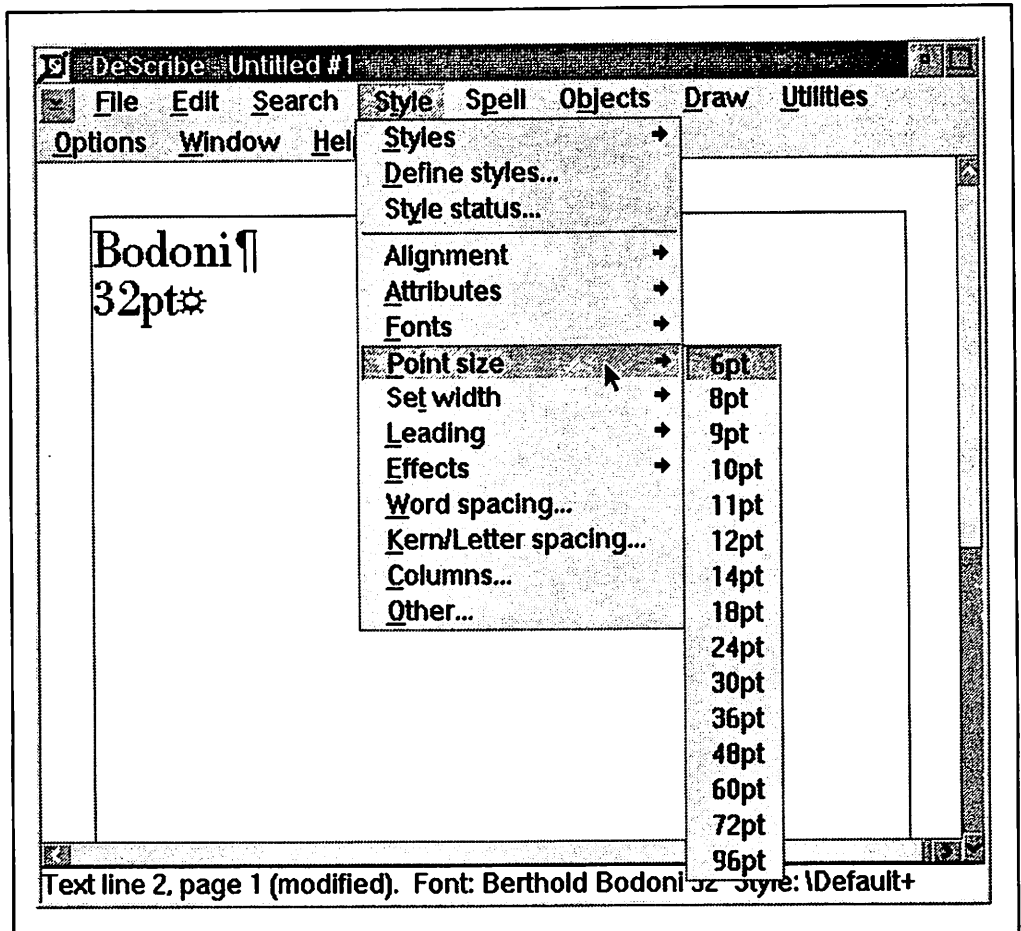


Figure 85. Available Point Sizes Available for Font Added in Font Palette

Some applications have their own internal fonts and do not use the system or printer driver installed fonts. Graphics and drawing programs that use vectors (lines and curves) are one of the best examples. Applications like CorelDraw! provide the user with functions to reshape text and therefore require their own outline fonts. In these cases the font that you installed in the system must also be installed in these applications or you will not have access to it in any of their font lists. The following figure shows the WFNBOSS utility that comes with CorelDraw! to install fonts for its use.

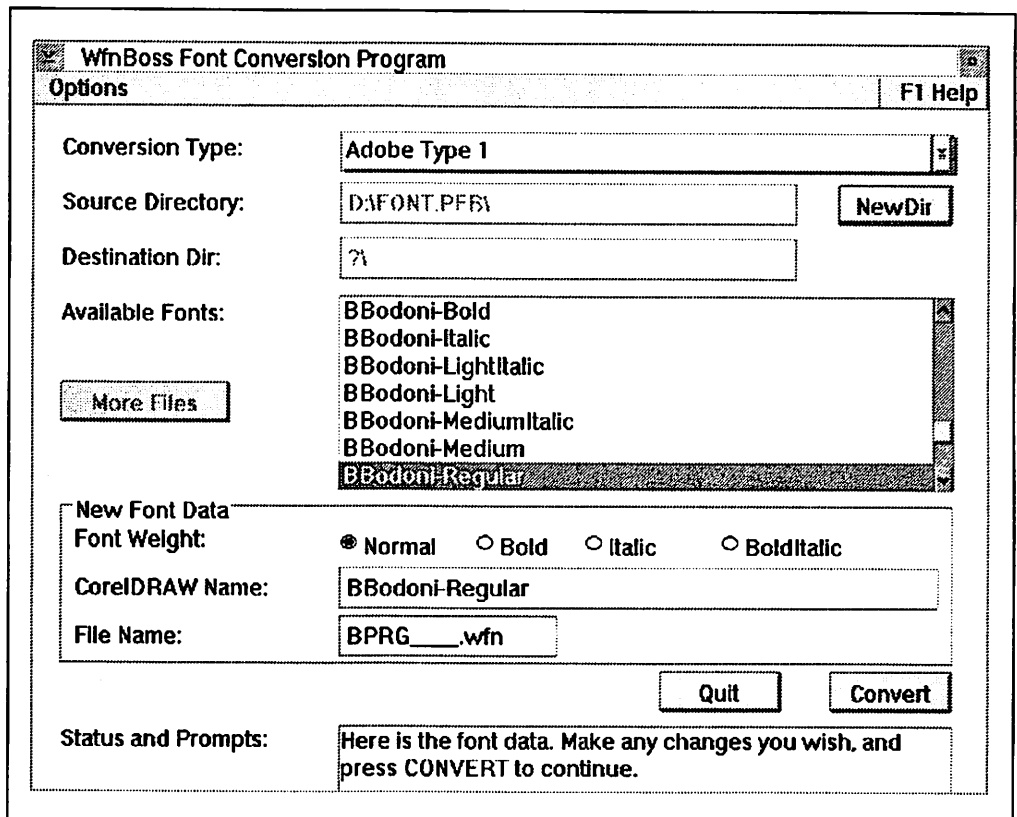


Figure 86. Installing an Additional Font in CorelDraw!

A case of installed fonts “disappearing” can occur in WIN-OS/2 if you change the output port of a PostScript printer *after* you install additional fonts in ATM. We reconfigured the printer from LPT1.OS2 to LPT2.OS2 with Bodoni Regular still installed in ATM and saw the following result.

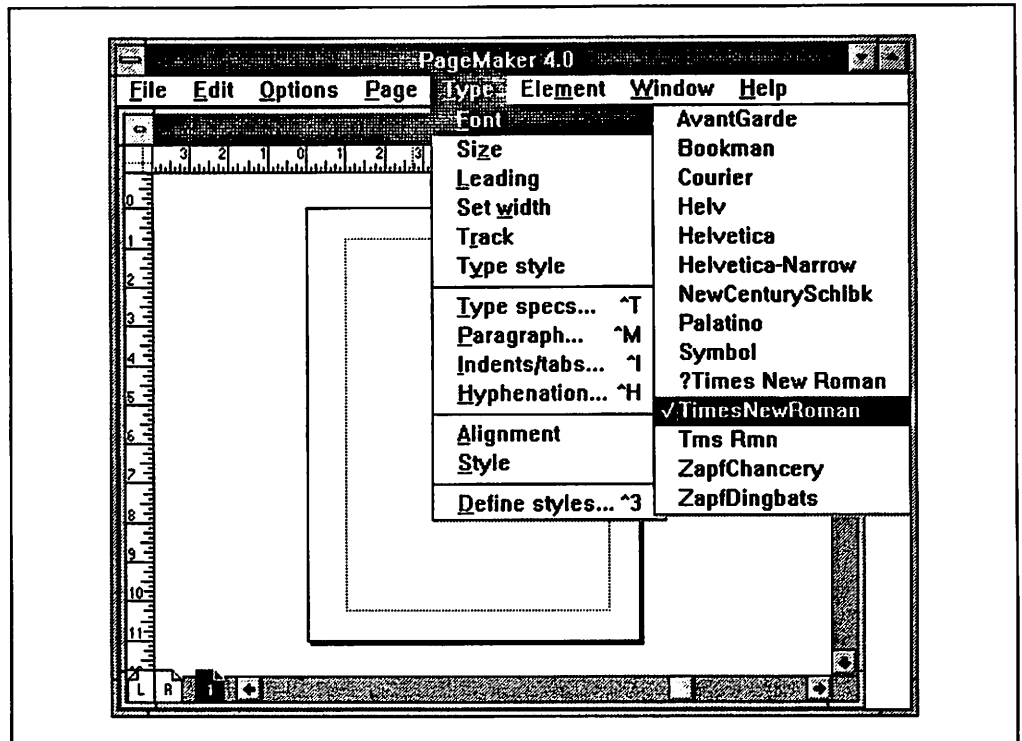


Figure 87. Font List after Changing Output Port of Printer

As you can see the font is no longer listed and therefore cannot be selected. This is not a problem with Aldus PageMaker. It is a problem with the way Windows manages the WIN.INI file. You must reinstall the font in the ATM Control Panel to see and use the font again. You could, instead, manually edit the WIN.INI file by moving the soft font section under the previous port to the new port. This is only recommended if you are familiar with the WIN.INI file and its usage.

## 6.2.2 Why is the Font Still There after I Delete It?

In every place you can install additional fonts for printing there should also be a way to delete them. The Font Palette for PM and the Adobe Control Panel for WIN-OS/2 delete fonts that are used system-wide. Printer drivers that have the ability to install fonts can also delete them. In the OS/2 PM environment we found that once a font was deleted from either the palette or the printer driver, it was removed from the lists of all of the PM applications we tested. The only minor inconvenience was in the Font Palette itself and is shown in the following section.

### 6.2.2.1 System Wide Fonts

The OS/2 V2.0 Font Palette allows you to delete the standard fonts and any additional fonts that you have installed. After deleting fonts in the palette, however, you will still see the fonts in the font list. In Chapter 4, "Fonts" on page 71 we emphasized that this program does not refresh its font list until you close the Edit font dialog and then reopen it. The following series of figures illustrates this.

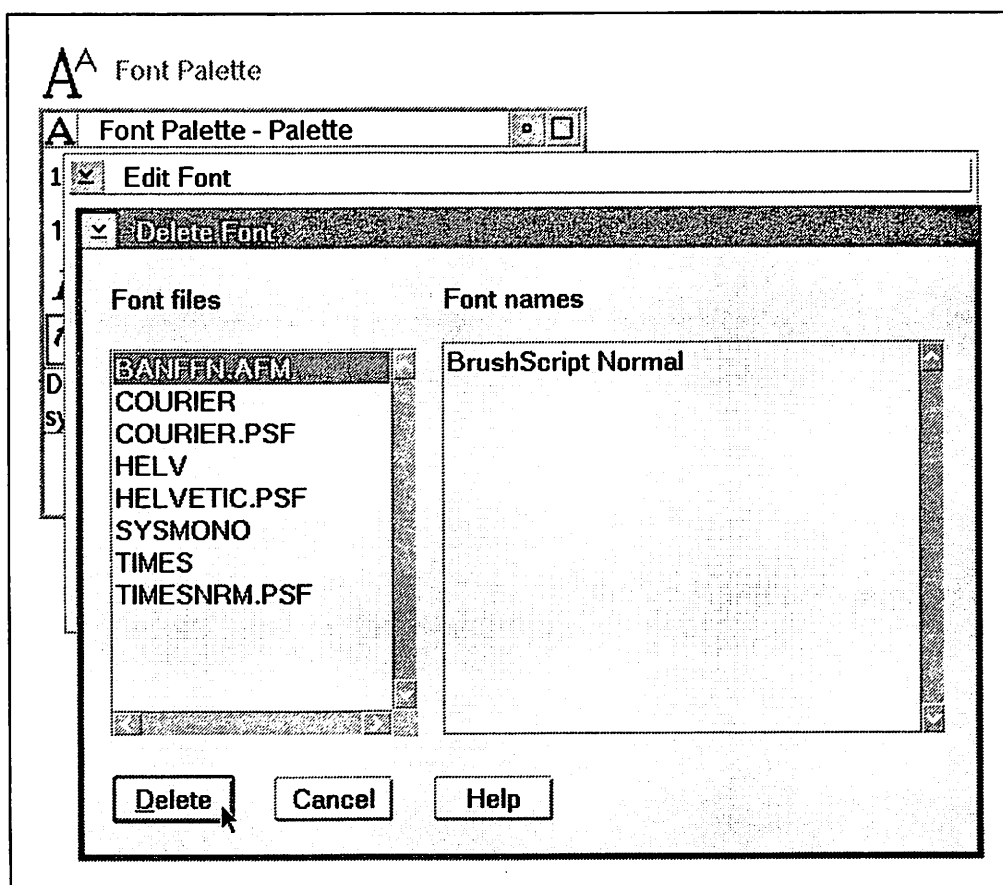


Figure 88. Deleting a Font in the Font Palette

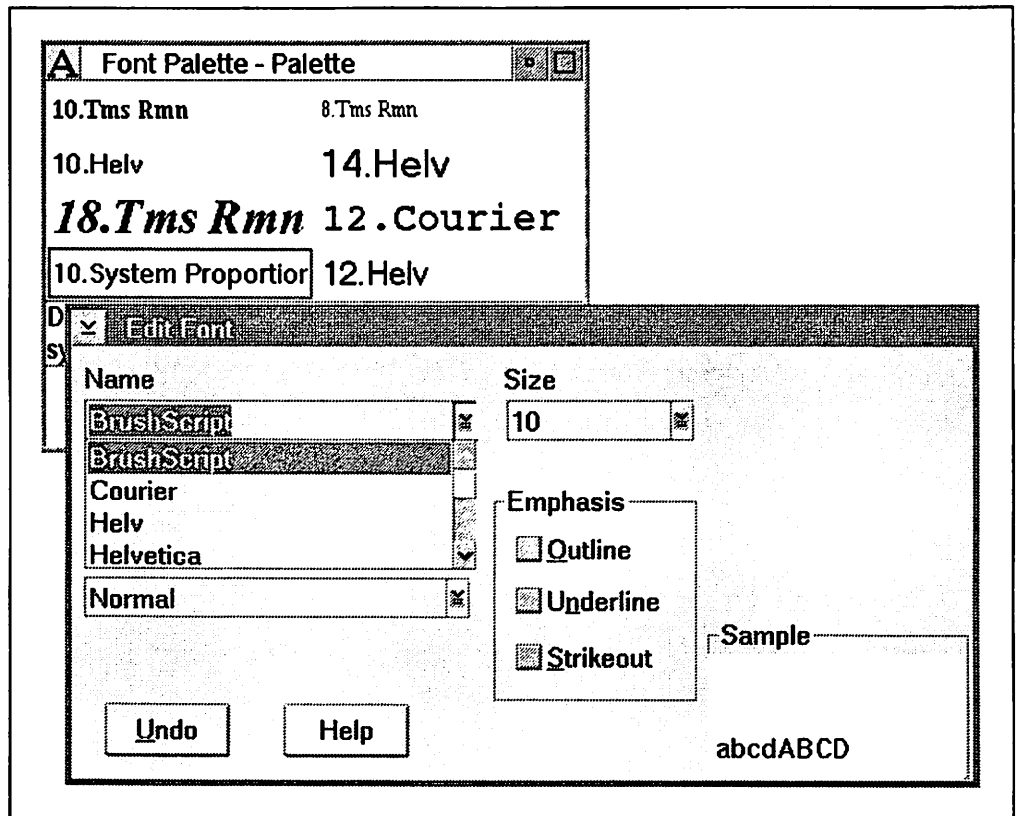


Figure 89. Font List after Delete with Edit Font Dialog Still Open

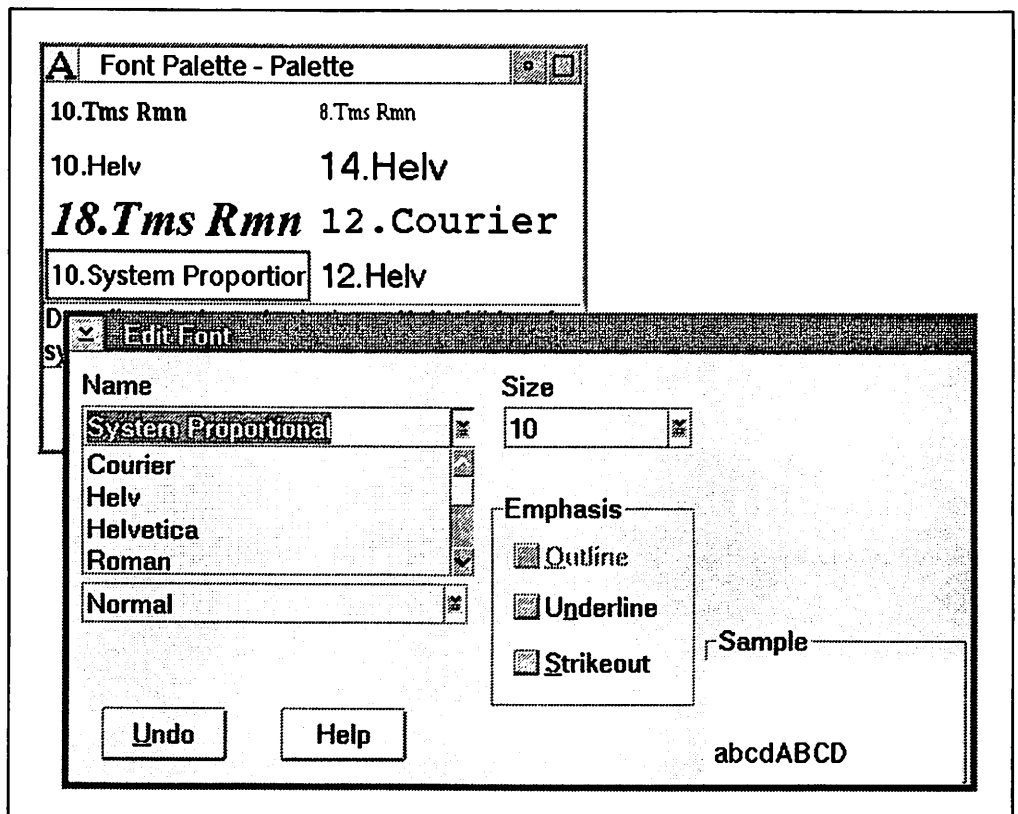


Figure 90. Font List after Closing and Reopening Edit Font Dialog

### 6.2.2.2 WIN-OS/2 ATM Fonts

In WIN-OS/2 there is a more severe problem that we outlined in 4.7.4, "Deleting Fonts for WIN-OS/2 ATM" on page 86. In that section we explained how ATM adds soft font entries to the PostScript printers that are listed in the WIN.INI file but does not *remove* them when you delete the font. We also told you that this requires you to manually edit the WIN.INI file and showed you how to do this. The following figures show the font list in Aldus PageMaker as you perform those steps.

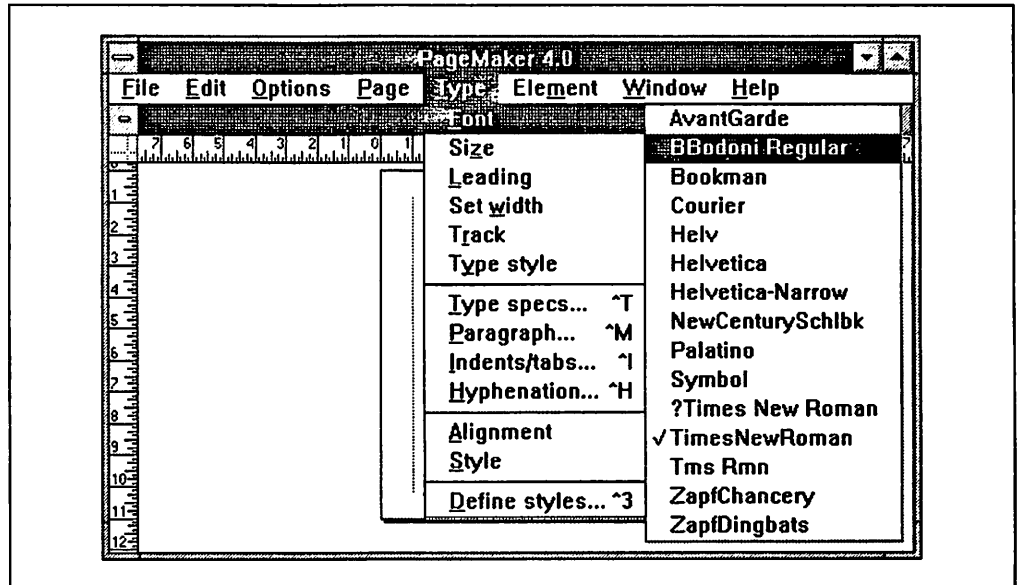


Figure 91. PageMaker Font List after Deleting Font From ATM

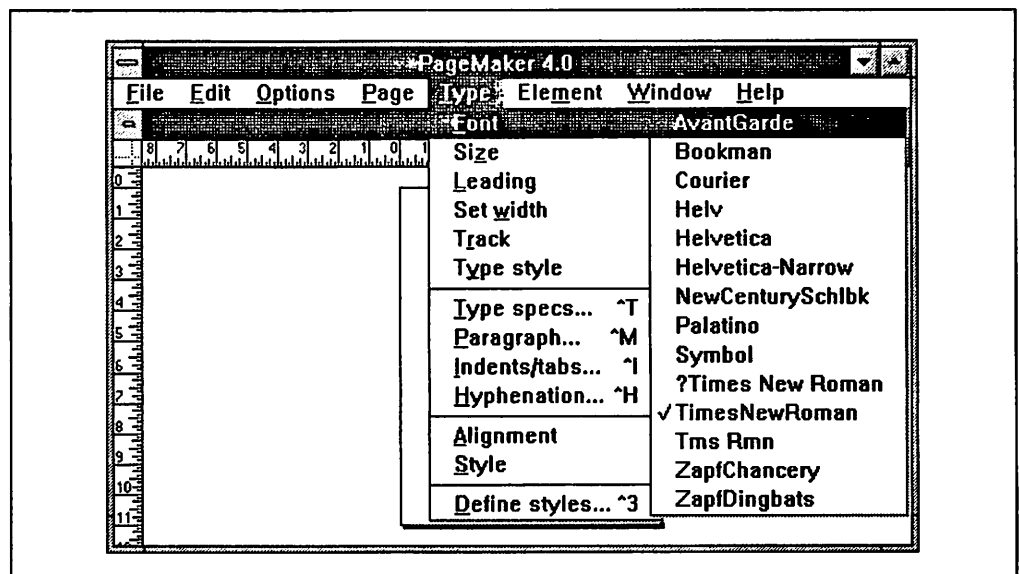


Figure 92. Font List after Delete and Manual Edit of WIN.INI File



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## 6.3 Application and System Printer Lists

For this section we set up two sets of printer objects. The setup on the local workstation is for a single printer attached to LPT1. The printer is an IBM 4029 with PPDS and PCL5 emulation and a second paper drawer. This printer has three printer objects defined for it.

1. **Print Screens** is an object that uses the IBM 4019 driver which outputs the PPDS data stream
2. **Letter** is an object that uses the LaserJet driver and sends output to the lower drawer on the printer
3. **Legal** is an object that uses the LaserJet driver and sends output to the upper drawer on the printer.

The setup on the network server is for four printers attached to LPT1, LPT2, LPT3 and COM1. The printers on LPT1 and LPT2 are IBM 4029s with a second paper drawer. The 4029 on LPT1 also has the PostScript option installed. The printer on LPT3 is a QMS ColorScript. The COM1 port has an IBM 6182 plotter with foil (transparency) material loaded. They are represented by five printer objects:

1. **Draft B&W** is an object that uses the IBM 4019 driver and sends output to the lower drawer on printers pooled on LPT1 and LPT2
2. **Final B&W** is an object that uses the IBM 4019 driver and sends output to the upper drawer on printers pooled on LPT1 and LPT2
3. **Draft Clr** is a printer object that uses the PostScript driver and sends output to the lower drawer on LPT1
4. **Final Clr** is a printer object that uses the PostScript driver and sends output to a color printer on LPT3
5. **Foils** is an object that uses the Plotters driver and sends output to a plotter on COM1.

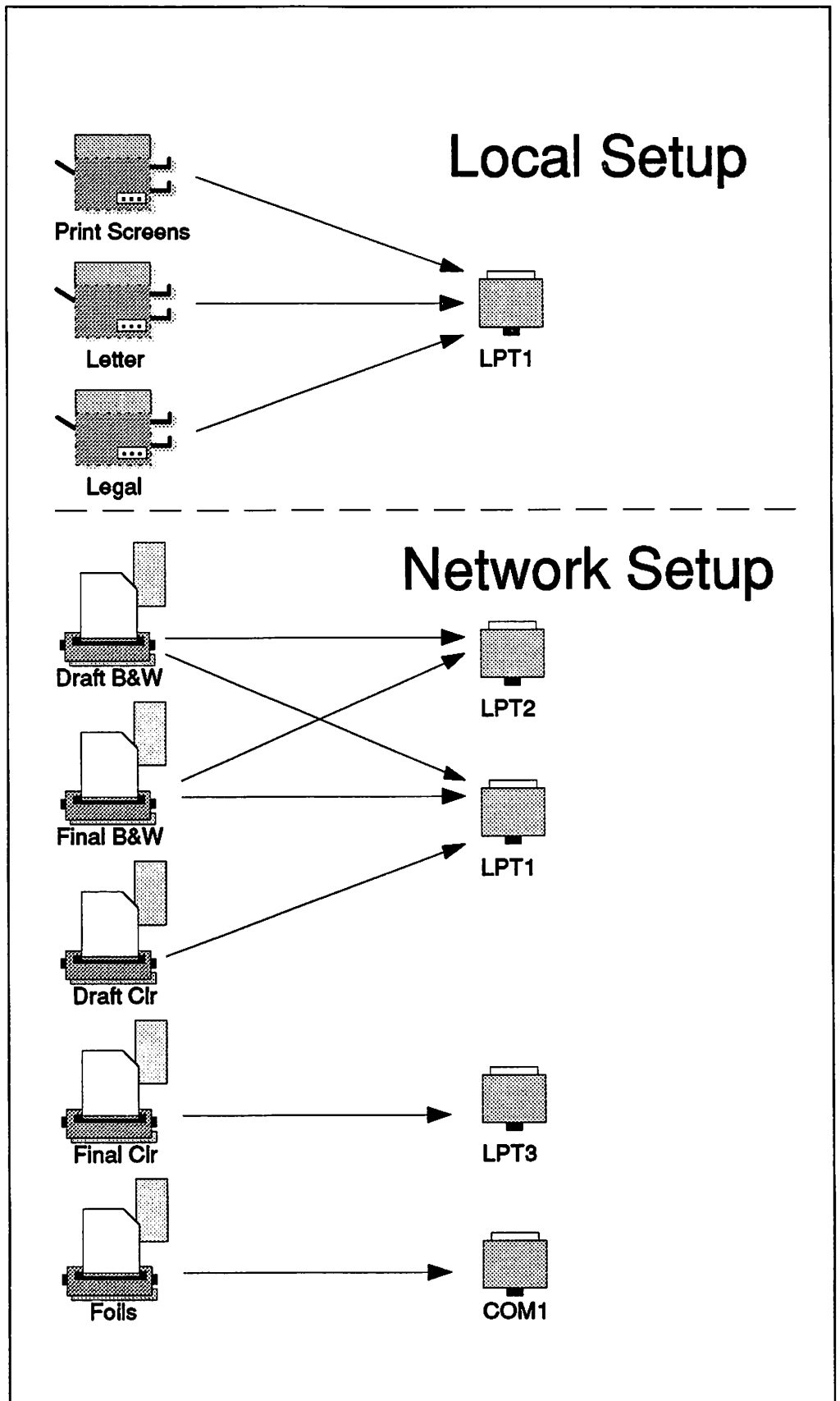


Figure 93. Printer Object Configurations for Local and Network Printers

### 6.3.1 Where Is the Printer I Just Installed?

Different applications are written by different programmers and each programmer has a "better" way of writing code. With respect to the code inside of the program that performs its unique functions this is probably true. With respect to interfacing to the operating system and its resources this usually results in confusion as each application presents you with a different view of these resources. The standardization of this interface is documented in the *OS/2 Programming Guide Volume 3*, Chapter 18. Things can get even more confusing in the network environment where "ghost" printers can appear in your application lists with no apparent way to delete them. We will look at the local environment as well as the network to point out some of this confusion and show you some ways around it.

#### 6.3.1.1 Locally Installed Printers

The available printer list for Lotus 1-2-3/G shows all three local printer objects but lists them by their physical (queue) name not their icon name. We purposely named a printer object with more than eight (8) characters to reinforce the discussion in 2.2.1, "Naming a Printer Object/Queue" on page 6.

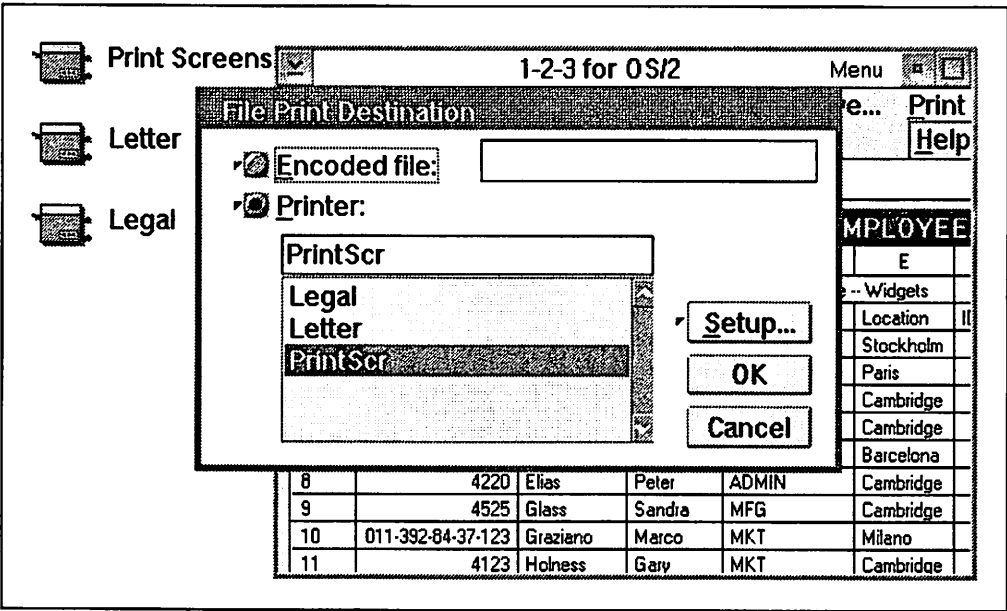


Figure 94. List of Available Printers in Lotus 1-2-3/G

The available printer list for DeScribe lists all three printer objects by their physical (queue) name but also displays the device name in front of each of the printers.

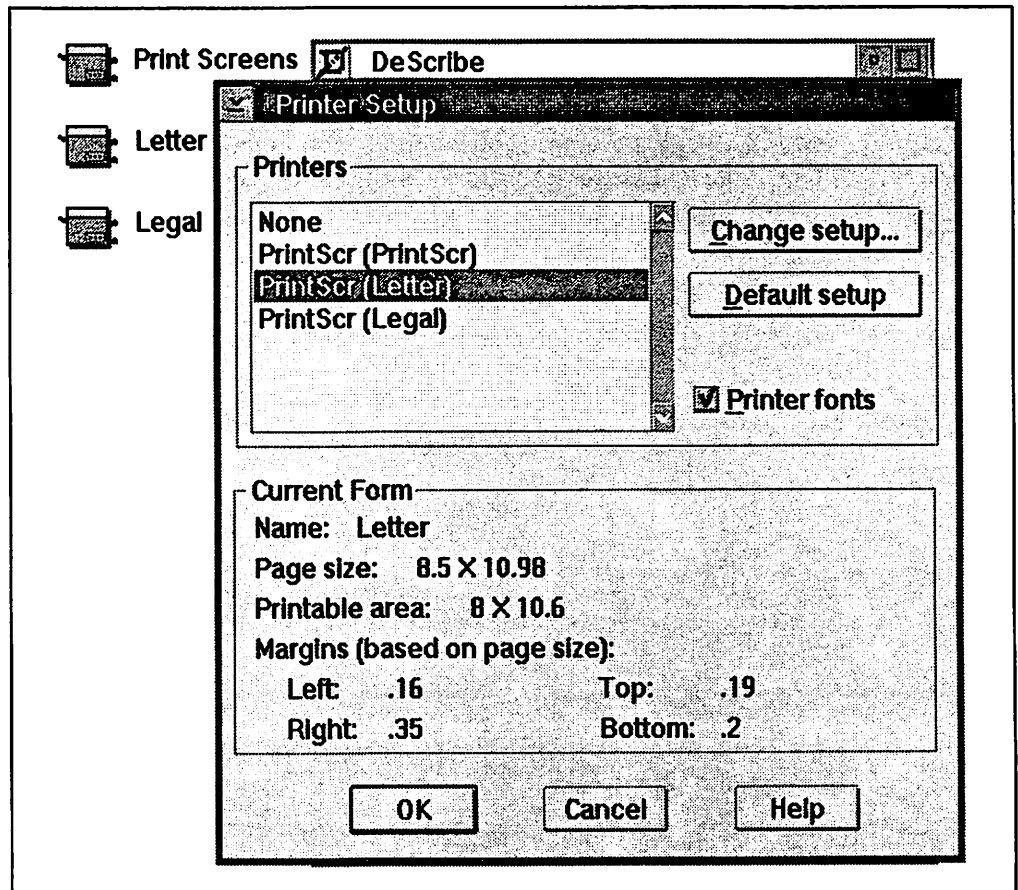


Figure 95. List of Available Printers in DeScribe

The Enhanced Editor that is in the Productivity folder is the best example of "where is my printer." This program evidently derives its printer list based on assigned ports as there is only one printer listed. The question, however, is which printer object is it referring to? You would expect, based on the DeScribe list, that the print job will go to the Legal printer object. In this case, however, it is sent to the Print Screens printer object.

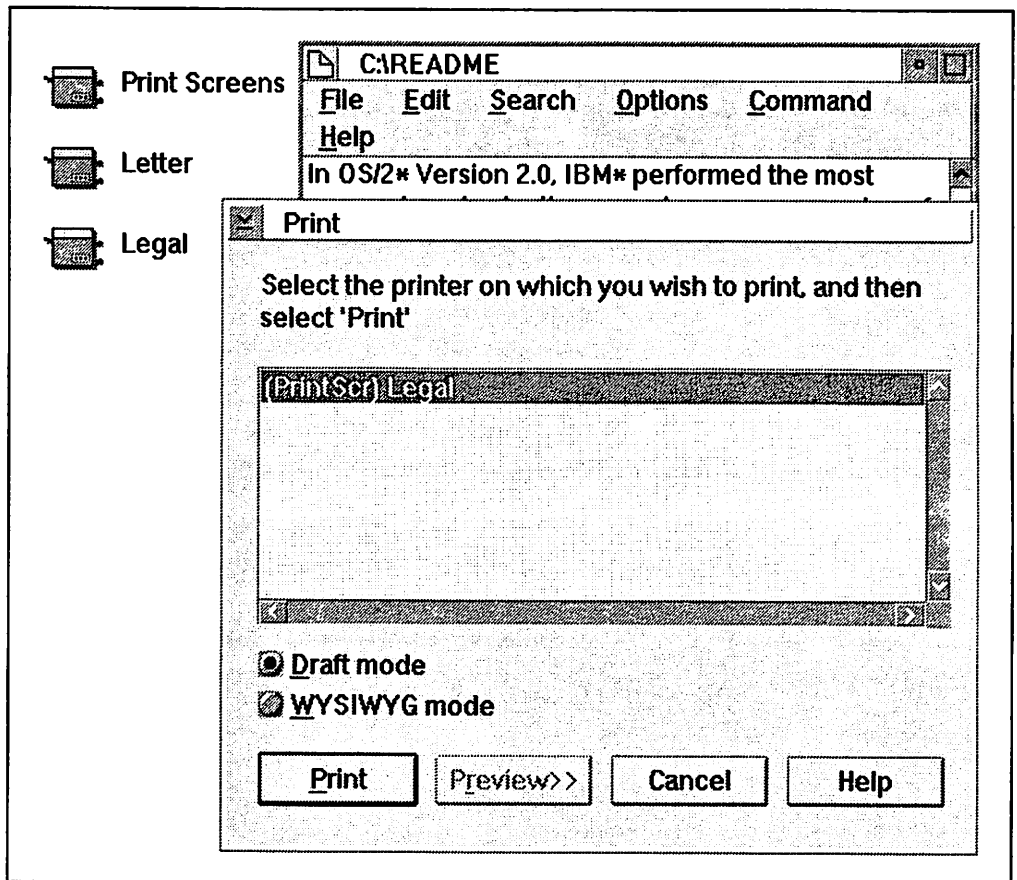


Figure 96. List of Printers in the Enhanced Editor with All Objects on LPT1

The more immediate problem is how to get the other printer objects to display in this list. This can be accomplished by a redirection of ports using the following steps:

1. Open the settings of the **Letter** and the **Legal** printer objects
2. Click on the **Output** tabs
3. In the **Letter** printer object click on **LPT2**
4. In the **Legal** printer object click on **LPT3**
5. Close both of the printer object settings
6. Open the settings of any printer object
7. Click on the **Output** tab
8. Display the context menu for **LPT2**
9. Click on **Redirection**
10. Click on **LPT1**
11. Display the context menu for **LPT3**

12. Click on **Redirection**
13. Click on **LPT1**
14. Close the printer object settings.

After doing these steps the printer list in the Enhanced Editor will now show all three printer objects similar to the way DeScribe shows them. There is one major difference. In DeScribe the name outside of the parenthesis is the actual queue the print job will go to while in the Enhanced Editor the name inside of the parenthesis is the actual queue the print job will go to.

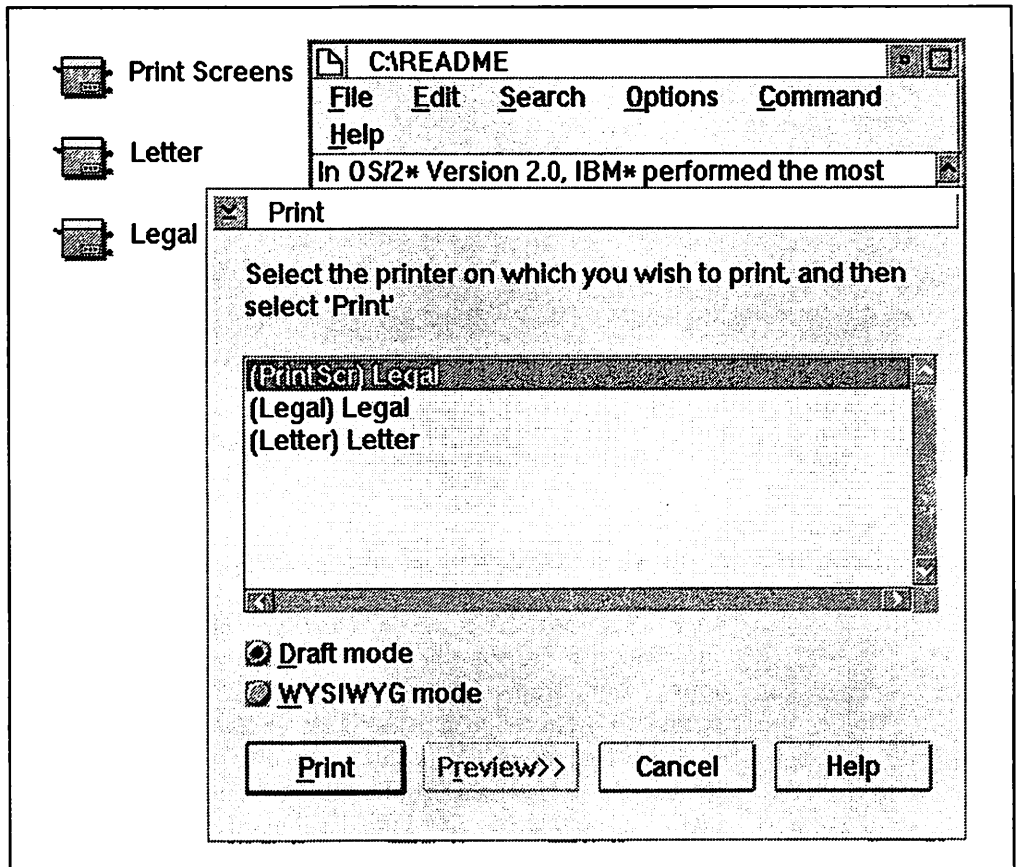


Figure 97. Available Printers after Reassigning to Three Redirected Ports

Also note the somewhat confusing listing outside of the parenthesis in the Enhanced Editor. If the printer objects had originally been created and assigned to LPT1, LPT2 and LPT3, and *then* redirected, the list would be less confusing as shown in the following figure.

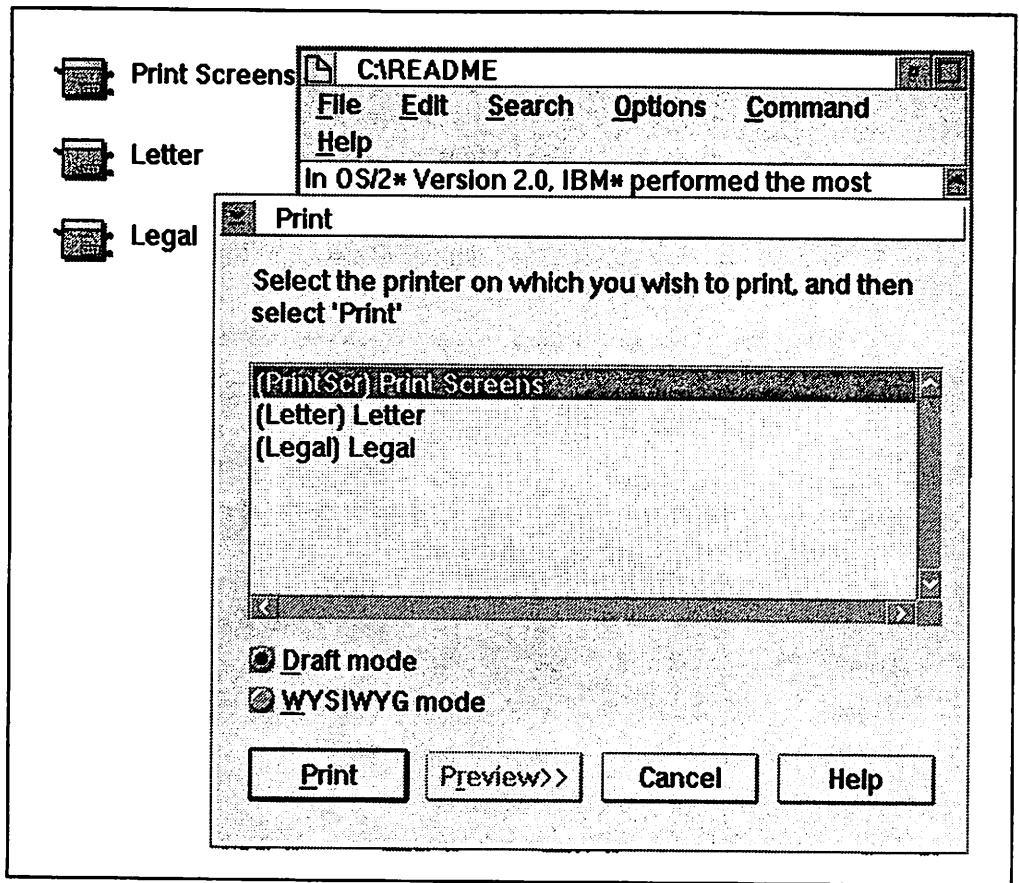


Figure 98. Available Printers after Installing on Three Ports then Redirecting

As you can see the order in which you create and configure your printer objects and assign their components can have an effect on the printer lists in applications. Until applications start to use the proper calls to retrieve information about the installed printers this confusion will continue. We end this section on local printer objects in application lists by showing you the worst of all cases. We renamed all of the printer objects and then displayed the application printer lists. The following figure is representative of what to expect. Notice the printer object names verses the names of the listed printers.

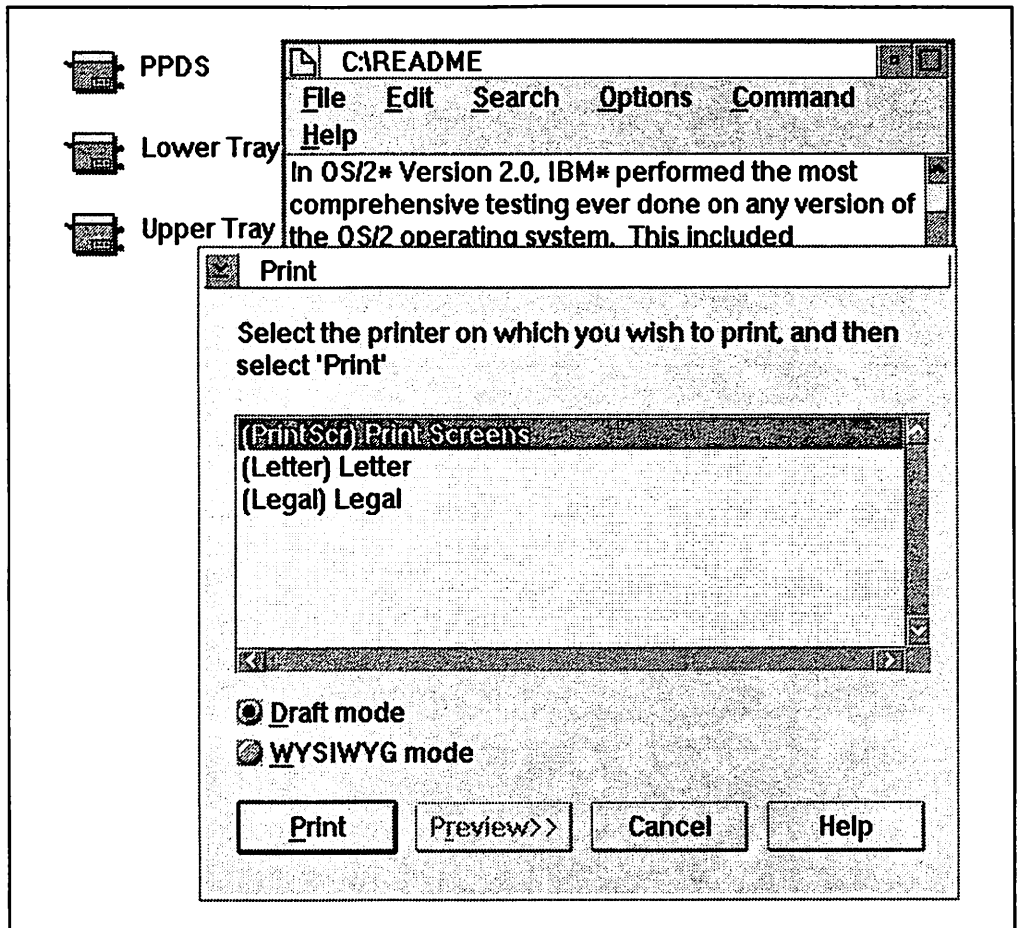


Figure 99. Available Printers after Renaming Printer Objects



### 6.3.1.2 Printers Installed on a Network

In 3.4, "Initializing LAN Shell Network Printer Objects" on page 61 we outlined the steps required to "initialize" network printer objects. Until they are initialized, you will not be able to select them from applications even though you can see them on your desktop in the Network folder. Even then, some applications will display the printers automatically while others must be restarted. The following figures show the progression of initializing network printers and the effect it has on application printer lists. Note that name of each window indicates which application the printer list is from; Lotus 1-2-3/G (File Print Destination), the Enhanced Editor (Print) and DeScribe (Printer Setup).

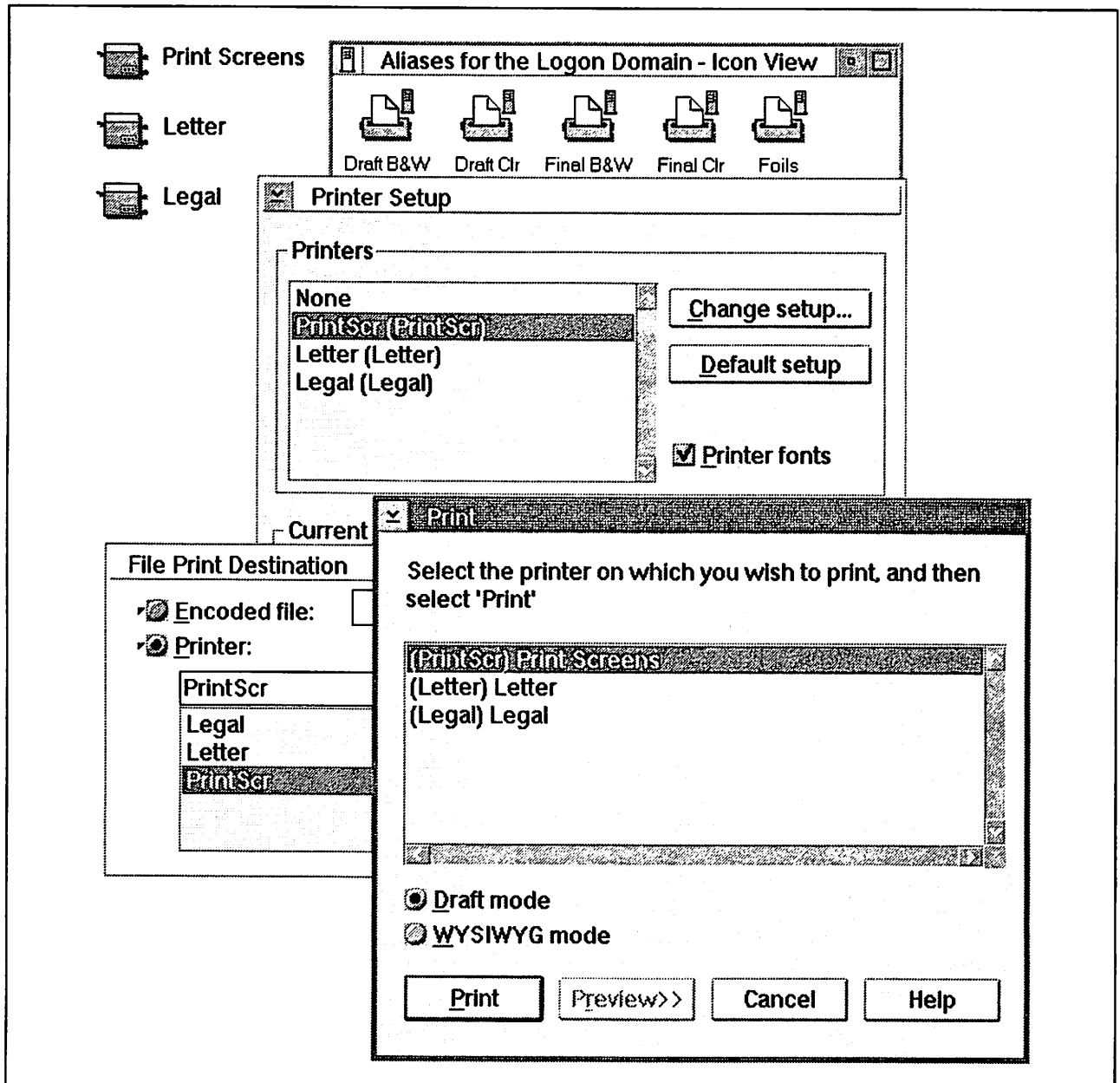


Figure 100. Printer Lists after First Time Display of Printers on the Network

The following figure shows the desktop and the application printer lists after we dragged and dropped the network printer objects from the alias folder, installed the requested printer drivers, and redisplayed the printer selection lists of our *opened* applications. Note that Lotus 1-2-3/G (File Print Destination) and the Enhanced Editor (Print) refresh their printer list every time you display it. DeScribe (Printer Setup) does not.

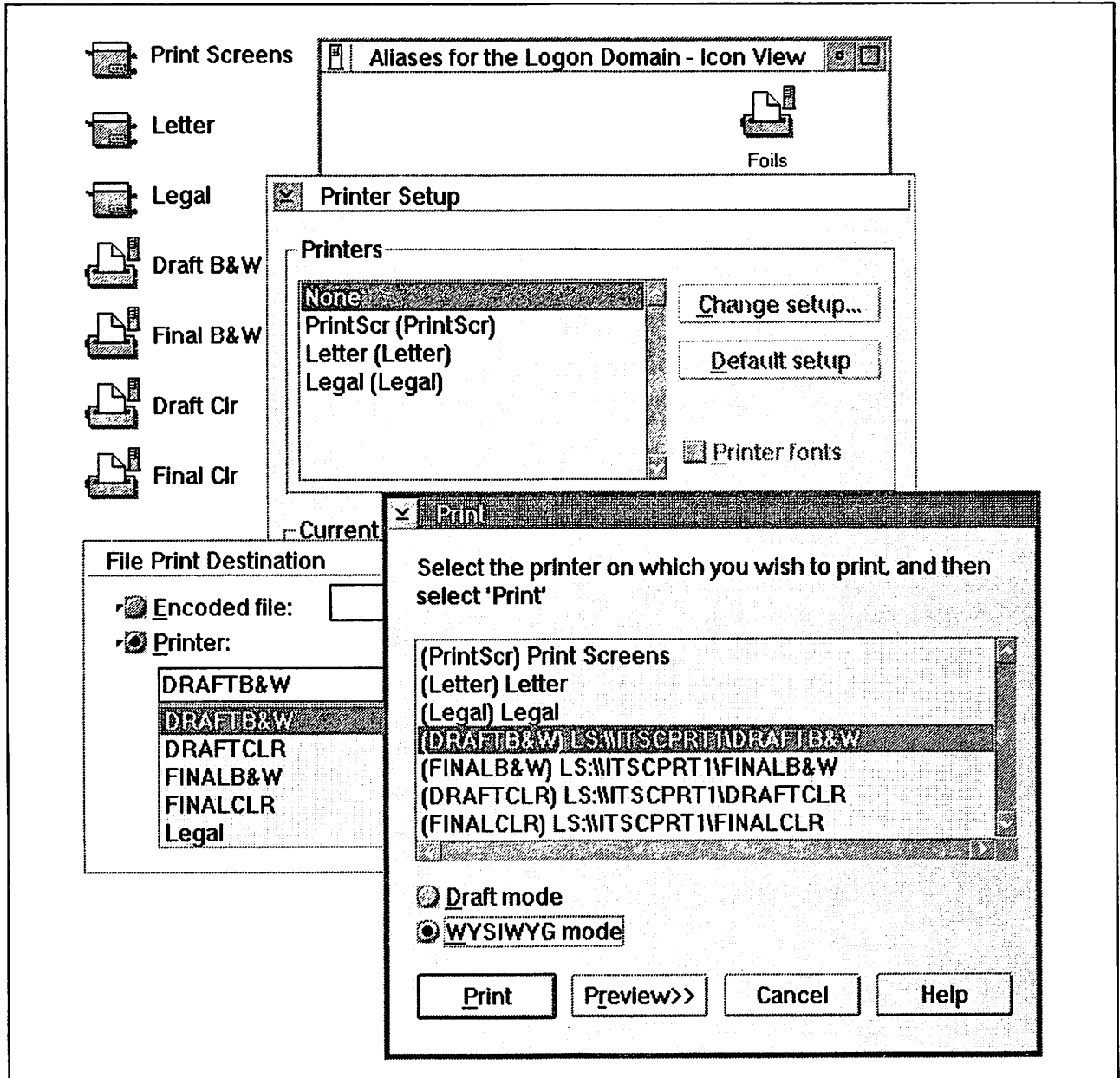


Figure 101. Printer Lists after Printer Initialization with Aps Still Open

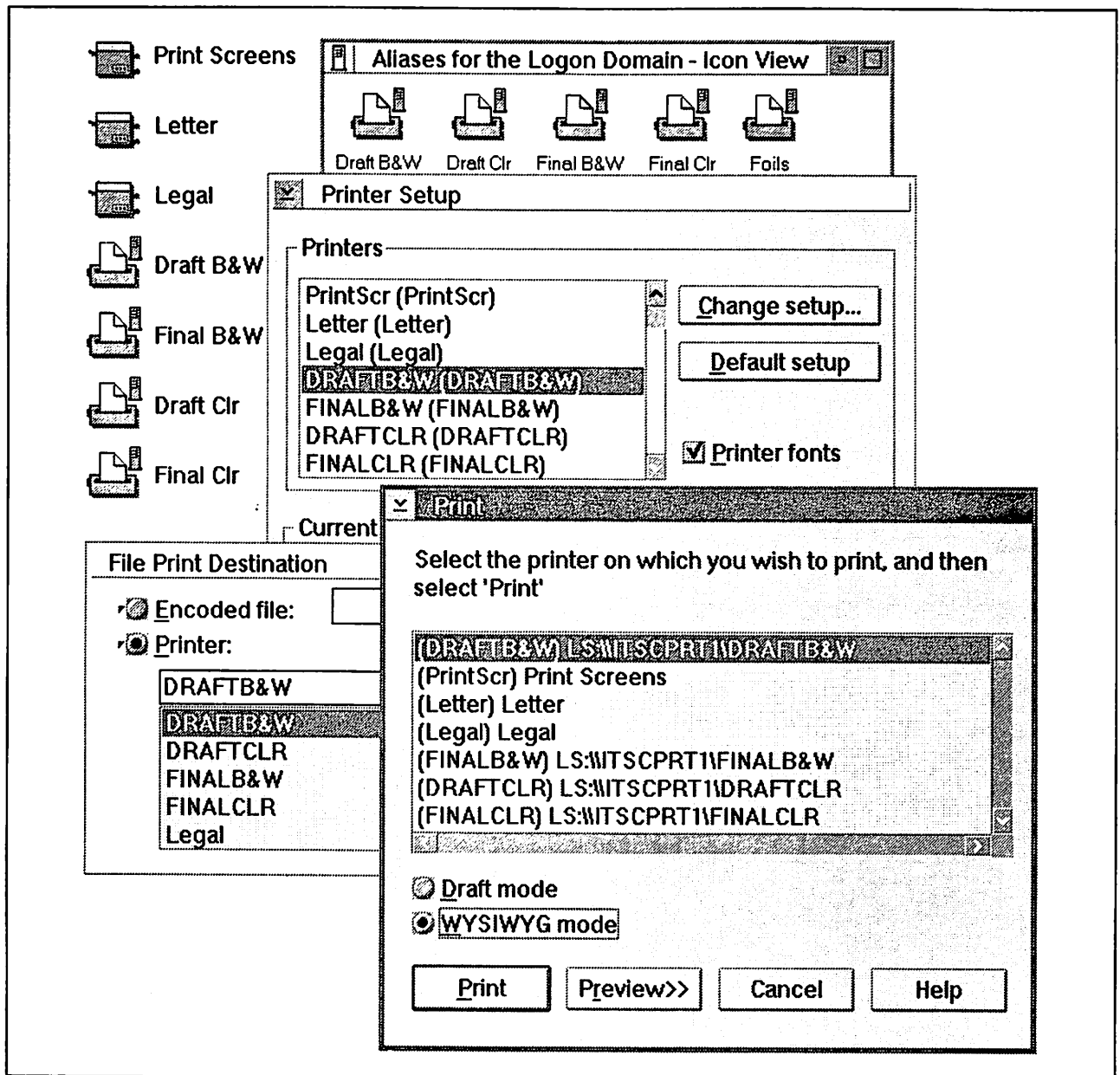


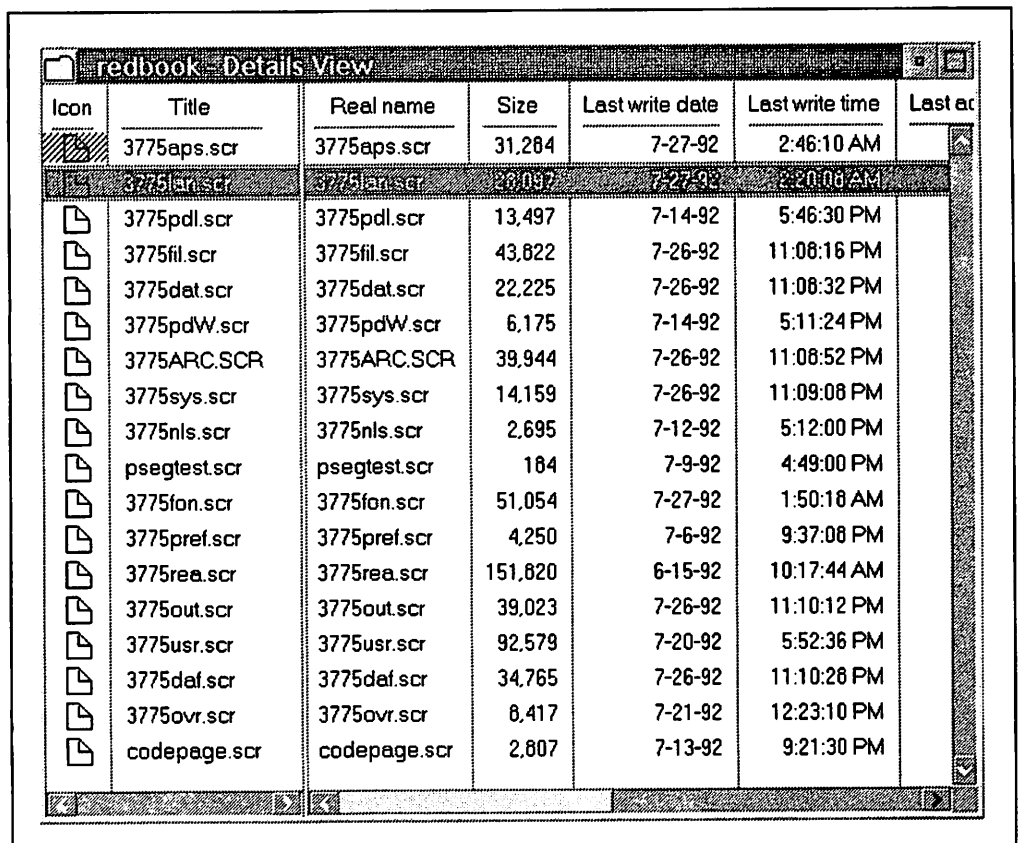
Figure 102. Printer Lists after Reopening Aps and Refreshing Aliases

### 6.3.2 Why Is That Printer Still There?

Once a network printer is initialized it will continue to appear in printer lists regardless of whether you are logged onto the network or not. This will give the appearance that these printers are available for output when they are not. We mentioned the extreme example in 3.5, "Removing Network Printers in the Workplace Shell" on page 62 where the machine itself is removed from the network without first deleting the printers from the Network folder and the network printer objects themselves do not exist outside of the Network folder. In this case you will not have access to the objects in the Network folder and network printers listed in applications and the default printer list will have no objects accessible with which to delete them. These in effect become "ghost" printers that will continue to exist until you log on to another network and delete them, rebuild your \*.INI files or reinstall OS/2.

## 6.4 Getting the Most Out of Print Screens

OS/2 V2.0 allows you to print Workplace Shell screens as well as full screen sessions that were available under previous versions of OS/2. What gets printed depends on where the mouse pointer is on the screen. If it is inside of *any* window, active or inactive, then *anything* within the frame of that window will be printed. If it is outside of all of the windows displayed on the Workplace Shell then the entire screen will be printed. In all cases it will not print the mouse pointer itself. This flexibility will allow you to print multiple windows without printing the entire screen by putting them within the frame of a larger window. If you want to print pull-down menus be careful that they do not extend outside of the frame or they will be cut off. The following figures show you some of the various ways you can use print screens.



Icon	Title	Real name	Size	Last write date	Last write time	Last ac
	3775aps.scr	3775aps.scr	31,284	7-27-92	2:46:10 AM	
	3775lan.scr	3775lan.scr	28,097	7-27-92	2:20:08 AM	
	3775pdl.scr	3775pdl.scr	13,497	7-14-92	5:46:30 PM	
	3775fil.scr	3775fil.scr	43,822	7-26-92	11:08:16 PM	
	3775dat.scr	3775dat.scr	22,225	7-26-92	11:08:32 PM	
	3775pdW.scr	3775pdW.scr	6,175	7-14-92	5:11:24 PM	
	3775ARC.SCR	3775ARC.SCR	39,944	7-26-92	11:08:52 PM	
	3775sys.scr	3775sys.scr	14,159	7-26-92	11:09:08 PM	
	3775nls.scr	3775nls.scr	2,695	7-12-92	5:12:00 PM	
	pseptest.scr	pseptest.scr	184	7-9-92	4:49:00 PM	
	3775fon.scr	3775fon.scr	51,054	7-27-92	1:50:18 AM	
	3775pref.scr	3775pref.scr	4,250	7-6-92	9:37:08 PM	
	3775rea.scr	3775rea.scr	151,820	6-15-92	10:17:44 AM	
	3775out.scr	3775out.scr	39,023	7-26-92	11:10:12 PM	
	3775usr.scr	3775usr.scr	92,579	7-20-92	5:52:36 PM	
	3775daf.scr	3775daf.scr	34,765	7-26-92	11:10:28 PM	
	3775ovr.scr	3775ovr.scr	8,417	7-21-92	12:23:10 PM	
	codepage.scr	codepage.scr	2,807	7-13-92	9:21:30 PM	

Figure 103. Print Screen of a Window

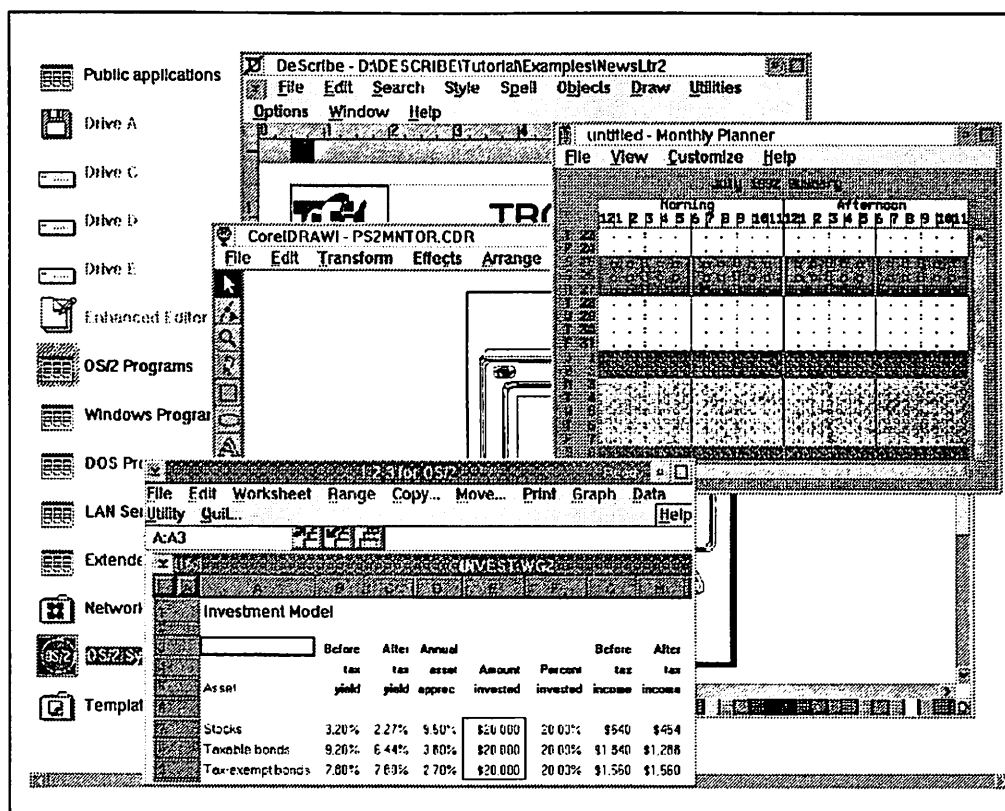


Figure 104. Print Screen of the Entire Workplace Shell

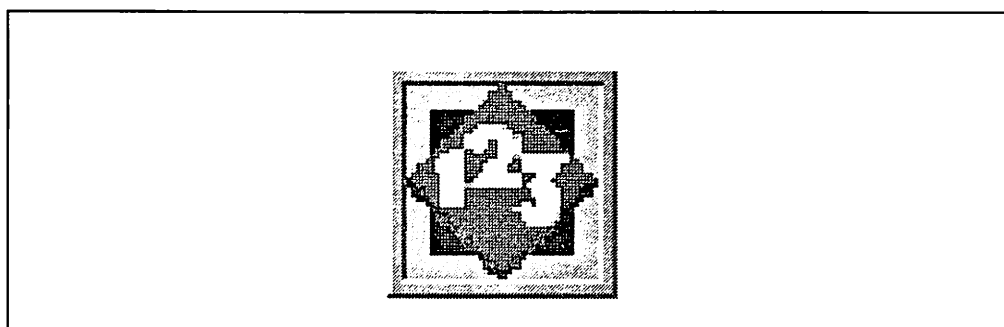


Figure 105. Print Screen of a Minimized Window

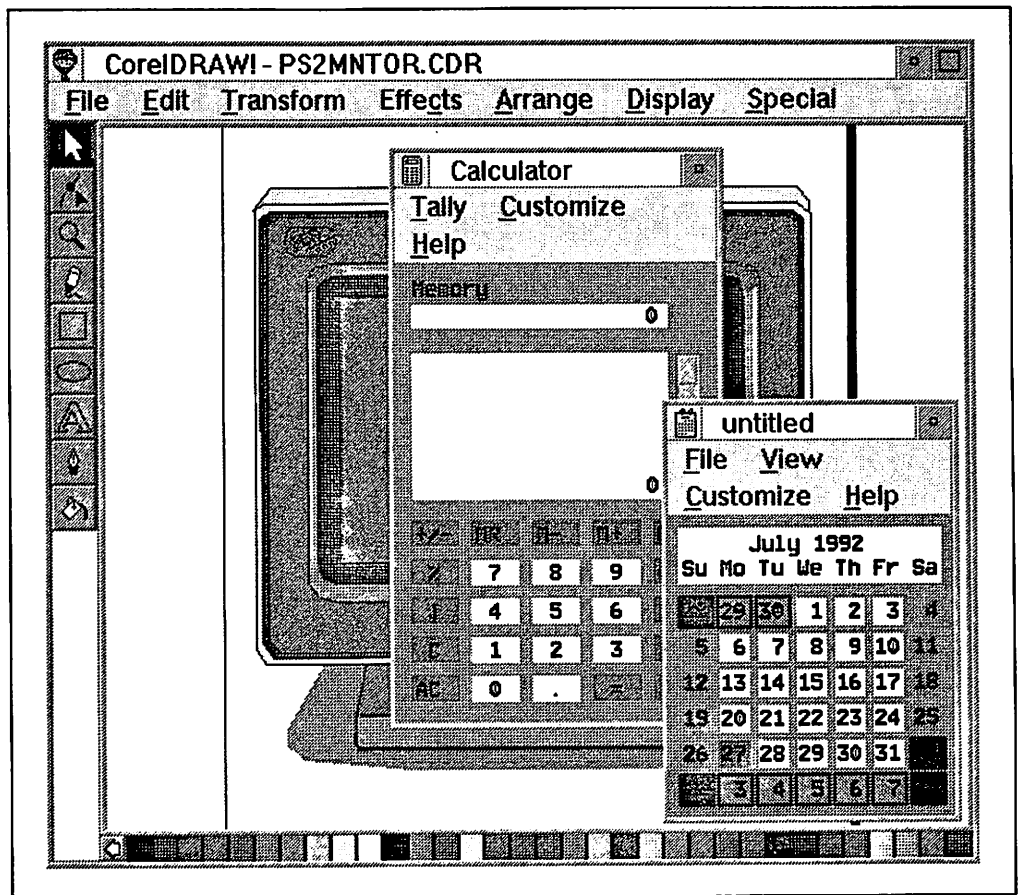


Figure 106. Print Screen of Multiple Windows

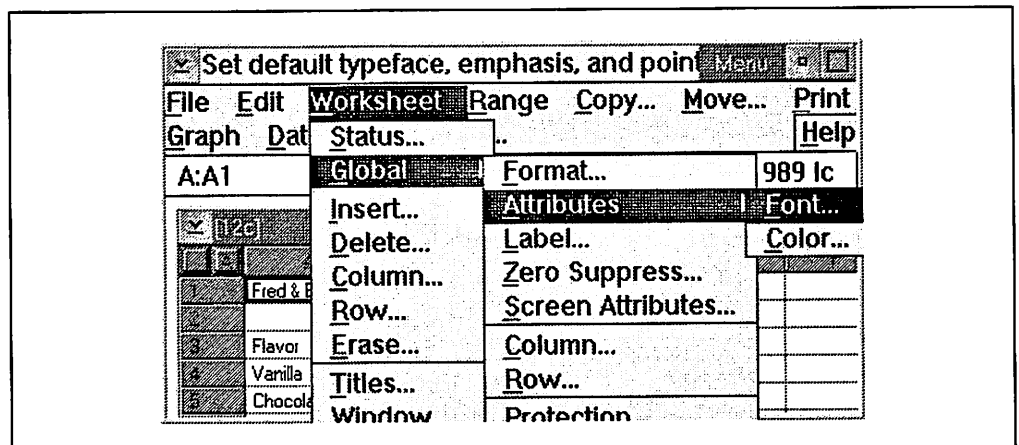


Figure 107. Print Screen When Menu Extends Outside of Frame

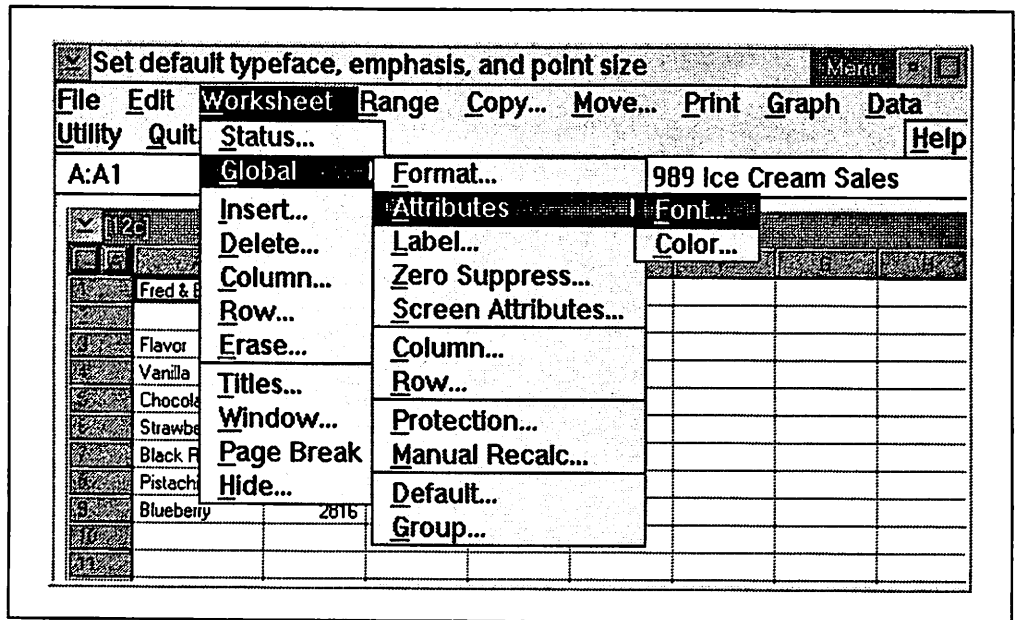


Figure 108. Print Screen with Frame Stretched to Capture Menu

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## Chapter 7. Print Subsystem Design and Components

The architecture of the OS/2 V2.0 print subsystem is similar to that of the OS/2 Version 1.3 print subsystem. However, there are some significant changes which are worth noting:

- The print subsystem has been enhanced to support the handling of printer output for programs running in WIN-OS/2 sessions.
- The user interface to the print subsystem is now the printer object. This replaces the dialogues provided by the OS/2 Print Manager and the OS/2 Control Panel for installing, configuring and controlling printers.
- All output directed to LPTx ports passes through the OS/2 file system, where, if the spooler is active, it is intercepted and routed to the spooler. This includes LPTx output from programs running in DOS sessions and LPTx and LPTx.OS2 from programs running in WIN-OS/2 sessions.
- Output sent to a COM port is not intercepted by the file system and sent to the spooler, but is passed directly to the serial port physical device driver. This applies to both OS/2 and DOS sessions. The program running in the OS/2 or DOS session controls the printer directly. Output from a WIN-OS/2 printer driver directed to a COM port is handled differently.

In order to support printing from WIN-OS/2 sessions, it was necessary to provide the Windows print subsystem which has its own spooler, printer drivers, programming interface and user interface. Although there are now two spoolers present in the system, the system's design is such that double spooling does not take place. Printers can be shared by OS/2, DOS and WIN-OS/2 sessions. The WIN-OS/2 print subsystem passes its output through the file system to the OS/2 print subsystem.

The WIN-OS/2 spooler will spool output destined for printers defined to the WIN-OS/2 Print Manager as being attached to a COM port. The printer output, in this case, is not sent to the printer via the OS/2 file system, but goes directly to the printer. The virtual COM device driver acts as a bridge to the serial port physical device driver COM.SYS. In Chapter 8, "Print Subsystem Data Flow" on page 173 the movement of jobs through the print subsystem is described more fully.

The print subsystem in OS/2 V2.0 consists of different components working together to serve the OS/2 environment as well as the WIN-OS/2 environment. It includes not just services on one side for the applications and on the other side for the physical port, or, the formatting of printing information for a particular printer, but also a new set of APIs called the Spl APIs.

There is not only an advanced technical print subsystem but also an advanced printer subsystem user interface embedded in the Workplace Shell that offers you an easy "drag-and-drop" way of creating, using and maintaining all of your available local printer devices as well as those on a network. For more information see also Chapter 2, "User Perspective" on page 3.

The technical components of the print subsystem talked about in more detail in this chapter are:

- File system
- Spoolers



- Printer drivers
- Kernel device drivers
- Port drivers
- Queue drivers.

---

## 7.1 File System

Printer drivers do not distinguish between different types of ports. They call on an internal interface, `Prtxxx`, to perform this task on their behalf. The `Prtxxx` interface then directs print data to the appropriate kernel device driver. This internal interface is based on the DOS file system calls and is, in effect, emulating a file system.

The ability of the file system to distinguish between different types of ports has important implications for printing. Print data arriving from sources *other than* a PM application, comes into the print subsystem via the file system. Jobs arriving from these *other* sources that are destined for LPTx or LPTx.OS2 ports are intercepted by the file system and are passed to the OS/2 spooler through the spooler `SplQmxxx` interface. However, jobs sent to COMx ports are not intercepted by the file system and instead pass directly to the kernel device driver without being spooled.

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## 7.2 Spoolers

There are two spoolers within the OS/2 V2.0 print subsystem. The OS/2 spooler which was present in previous versions of OS/2 1.x has been enhanced in OS/2 V2.0. The second spooler is referred to as the WIN-OS/2 spooler and it *can* receive print data from all Windows applications which you can now run in WIN-OS/2. These two spoolers provide enhanced spooler services to WIN-OS/2 applications as WIN-OS/2 print jobs can be routed to the OS/2 spooler. The choice of which spooler will operate on a WIN-OS/2 print job is dependent on several factors, for example, whether or not the OS/2 spooler is disabled and the port destination of the WIN-OS/2 print job.

The OS/2 spooler is the central coordinating process of the print subsystem. The main function of the spooler is to write printer output which has been intercepted by the OS/2 file system, to disk for later processing by a queue driver.

The spooler is implemented as a number of queues, one for each print object defined in the system. Applications create print jobs which are placed in one of the queues. These jobs are sent to a printer that is connected to the queue. The spooler provides flexibility to the user while at the same time optimizing the use of the system's print resources:

- Programs generating output for the same printer object can run concurrently. The spooler treats each program's output as a separate job and creates a new file on disk for each print job.
- A single program may generate output to more than one queue.
- Printing and program execution can be overlapped. Usually a print job must be complete before it will be scheduled for printing. It is, however, possible to start a job printing before it is completely queued in order to optimize use of the printer.

- Multiple queues (sharing) can be associated with a single printer. The different queues can be used to designate jobs requiring special handling such as jobs requiring a special size paper or large print jobs, which will be printed during off peak periods.
- A single queue can have several printers servicing it (pooling). The association of queues with printers is very flexible. This is important when configuring network print servers, where multiple printers may be connected to a single server. Load balancing across similar printers attached to a server can be achieved transparently.

For information on how the spoolers interact within the WIN-OS/2 printing environment, see 8.3.2, "WIN-OS/2" on page 184.

### 7.2.1 Spooler Tasks/Services

The OS/2 spooler is the central coordinating process for the entire print subsystem. It provides flexibility in organizing and optimizing the use of printers. It has a global view of the printing resources of the system, particularly in the server environment, and is therefore able to make best use of them.

- Print output from two separately executing applications is not intermixed on the printer. As an optional optimization, the OS/2 spooler can start printing a job before it is completely enqueued; refer to 2.2.4.4, "Queue Options" on page 15 for more information on printing while spooling. Successive jobs are then enqueued as normal.
- The OS/2 spooler can print a job in the background while the user continues to use the application, that is, the spooler has its own thread which runs in the background with low priority. Since your applications are running under higher priority they can end their print jobs whenever they desire and so control is passed back to your application as quickly as possible so that you can continue to work with it. Usually, it is not important to receive print output in *real time*. Rather, it is far more important to have a very responsive and fast application that does not have to wait for any print services, which are usually far from quick because printers and plotters are relatively slow output devices.
- The OS/2 spooler can send print jobs from Presentation Manager across a network to a server without any special knowledge from the application because PM print jobs are routed directly to the OS/2 spooler. Note that print jobs from non-PM applications are intercepted by the OS/2 file system and *then* passed on to the OS/2 spooler.
- Queues within the OS/2 spooler can be used for different purposes. For example, you could use one queue for large print jobs which are printed at other times of the day when print demand is much lower. Or, you could configure a queue which prints jobs using a different size of paper than another. Print jobs on this queue could then be held until the correct size of paper was loaded into the printer. See 5.3.2, "Port with Multiple Printer Objects (Sharing)" on page 113 for procedures on how to do this.
- The OS/2 spooler can support a number of printers simultaneously and can be configured so that jobs on a single queue can be shared among all the printers. This load balancing, called pooling, is particularly important in server environments and can be achieved without the knowledge of your applications. See 5.3.1, "Printer Object with Multiple Ports (Pooling)" on page 111 for procedures on how to do this.

- Jobs can be reprioritized while they are waiting in the queue. For example, an urgent job can be given a higher priority than other queued jobs or can be selected to print next.

The OS/2 spooler is actually a software component of the OS/2 V2.0 operating system which supports four main activities via four different spooler interfaces, as follows:

1. Management of spool buffers for PM\_Q\_STD data via the SplStdxxx interface
2. Management of queued files via the SplQmxxx interface
3. Processing of queued files through the SplQpxxx interface
4. Displaying screen messages through SplMessageBox.

For a detailed description of how these interfaces interact with the print data, see *OS/2 2.0 Technical Library Presentation Driver Reference Version 2.0*, Chapter 4, "Graphics Engine Hardcopy Drivers.."

When the OS/2 spooler receives print data from your application, it queues it by writing it to a subdirectory on your hard drive. This subdirectory is created when you create a printer object and each printer object on your system has a specific subdirectory, or queue, where its print jobs can be safely held while awaiting printing. You can view your list of print queues by displaying the SPOOL folder (directory) which can be found in the root of your install drive. Each listed subdirectory will have a separate name so that each queue is unique to a particular printer object on the desktop.

**Note**

This information is provided for the rare case that a print job sent to one of the queues "locks up" the system and when you reboot the system keeps trying to print the job and stays locked. You can recover by booting from the OS/2 install diskettes, going to the command prompt, and then deleting the job in the queue. Remember; all management of the queues should normally be done through the printer objects.

When print data is spooled to the queue, the print subsystem recognizes that a job has been created which has job properties and a print priority within the queue. The queued print job is also referred to as a spool file and the data format of these files can vary.

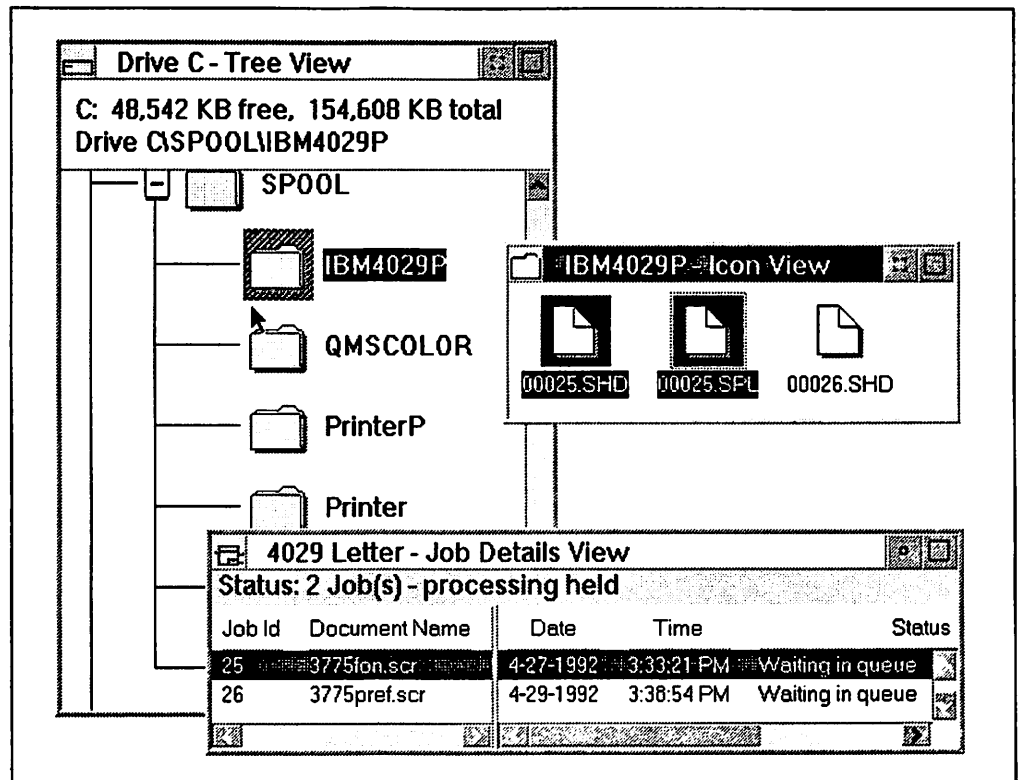


Figure 109. Spool Folder with Queues and Print Files vs. Printer Object Jobs

## 7.2.2 Spool File Formats

The print jobs held in the OS/2 and WIN-OS/2 spooler queues are also referred to as spool files.

When the OS/2 spooler spools (writes) a print job to your hard drive, it is spooled as two files, that is, the \*.SHD and \*.SPL files.

**\*.SHD** This file contains the job property data for the print job.

**\*.SPL** This file contains the actual print job data.

Spool file data on the OS/2 spooler queues is in one of two formats, either raw data in the PM\_Q\_RAW format, or, standard data in the PM\_Q\_STD format. The WIN-OS/2 spooler only creates a single spool file, \*.TMP, which is spooled to the root directory of your boot drive. Spool file data on the WIN-OS/2 spool queues are only in the raw format.

**PM\_Q\_STD** Standard output data is spooled as a PM metafile, that is a series of graphics orders stored in a packed binary format. Hence PM\_Q\_STD print jobs are usually created through the GPI (Graphic Programming Interface).

The advantage of the PM\_Q\_STD format is that the spool files are much smaller than PM\_Q\_RAW format files. The smaller file size saves disk space for jobs in the spooler queue and reduces network traffic when transmitting the data to a server.

The content of PM\_Q\_STD jobs can be viewed using the PICVIEW application. This is achieved by double clicking on the printer object and then double clicking on the print job object, in

the icon or detail view. The multi-page spool file can be shown in a device-independent manner in which the content of the job can be easily recognized. See also Figure 25 on page 38 which shows an example of this.

After a job has been spooled and is ready to print, the spooler sends the PM\_Q\_STD format job to the queue driver. The queue driver then replays the metafile through the GPI to the appropriate printer driver for your printer. The printer driver then converts the PM\_Q\_STD to printer-specific format.

There are some restrictions on the content of PM\_Q\_STD format jobs which relate to the restrictions for PM metafiles. See the *Presentation Manager Programming Reference Volume 2*, Appendix G.

Presentation Manager applications that are not able to deal with these restrictions should enqueue print jobs using the PM\_Q\_RAW format. The cost is an increase in disk space used and possibly more network traffic.

You can select to convert all PM\_Q\_STD jobs to PM\_Q\_RAW format by selecting the **Printer specific format** option on the **Queue options** tab of your printer object settings.

**Note**

Print jobs sent to network servers that do not support OS/2 V2.0 Presentation Manager are automatically converted to the PM\_Q\_RAW format by the system prior to transmission to the server. The application can still continue to specify the PM\_Q\_STD format.

## **PM\_Q\_RAW**

Raw data actually consists of the printer specific commands to print the job. For example, raw data created for an HP LaserJet printer consists of PCL (Printer Command Language) commands and raw data created for a PostScript printer consists of PostScript commands.

The content of PM\_Q\_RAW jobs can be viewed using the system editor. You can do this by double clicking on your printer object and then double clicking on your job object icon. See also Figure 25 on page 38, which shows an example of this. However, it is not always easy to recognize the content of a print job; for example, it would be very difficult to interpret a PostScript file to get a *visual* idea of the final output from the printer.

Print jobs are created by the file system as a result of printing directly to the physical port using either INT17 or INT21 under DOS or the DosOpen API under OS/2. These print jobs are always enqueued using the PM\_Q\_RAW format.

Presentation Manager applications can also use the PM\_Q\_RAW format. The overall print job creation process is normally slower this way as the printer driver has to do more work to create the printer-specific format.

If you have selected the **Print while spooling** option on the **Queue options** tab of your printer object settings then you may

see a faster printing response. In particular, for a multi-page document, the first page starts printing as soon as the printer driver has completely finished converting the GPI format to the printer-specific format.

**Note**

Presentation Manager applications should always specify the PM\_Q\_STD format. The difference can be from a factor of 2 to a factor of 50 greater disk space used for the PM\_Q\_RAW spool file format.

For non-PM applications you can optimize your printing performance by selecting the Print while spooling option.

Other spool file data formats can be supported by writing an appropriate queue driver. See the *OS/2 2.0 Technical Library Presentation Driver Reference*.

### 7.2.3 Recommendations

Note that it is possible to disable both spoolers independently. If you choose to do so then you will lose all of the services and safeguards that they provide. This action is not recommended.

Applications that *require* switching off the OS/2 spooler are to be considered as being not well behaved. Such applications can no longer be accepted in a multi-tasking and multiuser (LAN) environment. OS/2 V2.0's print subsystem provides all the necessary services to applications running under OS/2.

Spool files can become very big. Printing a color bitmap can easily result in a temporary spool file with a size of 10 megabytes or more. Take account of this when planning for DASD capacity on a LAN server with several printers and lots of users.

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## 7.3 Presentation Manager Printer Drivers

The data stream that needs to be sent to a printer in order to produce a particular result differs widely depending on the make and model of a printer. Some printers are also able to support more than one data stream, for example, the IBM 4019 and 4029 can support:

- Proprinter data stream (PPDS)
- Hewlett-Packard Printer Control Language (PCL)
- PostScript.

In order to shield the application from the complexity of having to generate different data streams for different printers, the OS/2 V2.0 Presentation Manager uses printer drivers. Different models of printers supported by OS/2 have different printer drivers. Printer drivers are DLLs with a file name extension of .DRV.

When an application opens a device context for a printer, the graphics engine will load the printer driver, configured for the printer, and pass GPI calls made by the application through to the printer driver. When the queue driver prints the graphics engine also loads the printer driver.

The printer driver must provide the following functions:

- Display a dialog which allows the user to describe the printer's physical configuration.

This might include details of the number of paper drawers installed in the printer and the form size and type contained in each of the drawers. Also information about optional hardware fonts installed in the printer would be entered.

- Display a dialog which allows the user to enter job properties.

Job properties are used to select job features such as the paper orientation to use, portrait or landscape.

- Respond to application queries for printer capabilities such as color, resolution and available forms.
- Converting the GPI commands in a print job to the printer-specific commands that will produce the expected output.

Each OS/2 printer driver is logically split into two parts, which are most commonly distinguished from each other by referring to them as **Part 1** and **Part 2**. They have quite different functions and their services are called upon in different ways and at different times according to the type of application you are printing from and also depending on how it runs.

**Part 1** This part of the printer driver is only used by a Presentation Manager application that outputs print data using queued printing.

If your PM application prints in the PM\_Q\_STD format then Part 1 of the device driver will be used by the application to work in conjunction with the GRE (Graphics Engine) and the spooler so that the GPI calls sent by application are successfully written to the hard disk as a queued spool file.

If your PM application prints in the PM\_Q\_RAW format then this part of the printer driver works in conjunction with the GRE and the spooler to convert the GPI commands sent by the application into the PM\_Q\_RAW format data stream and then write this data to the hard disk as a queued spool file.

For more information about these data streams, see 7.2.2, "Spool File Formats" on page 159.

For more information about the data flow see 8.1, "PM Queued Printing (PM Applications)" on page 175.

**Part 2** This part of the printer driver is used by PM and non-PM applications and consequently receives print data in either PM\_Q\_RAW or PM\_Q\_STD format. Non-PM applications *a/ways* send their print data in PM\_Q\_RAW format, never in PM\_Q\_STD, and PM applications can send in either format.

If PM\_Q\_RAW data is received by Part 2 then the processing of the data is minimal and basically amounts to applying the job properties that have been selected. The PM\_Q\_RAW print data is then directed to the file system for routing to the parallel or serial kernel device driver. For more information on kernel device driver see 7.4, "Kernel Device Drivers" on page 168.

If PM\_Q\_STD data is received then it is converted into PM\_Q\_RAW data and passed on to the file system for routing to a parallel or serial kernel device driver.

For more information about these data streams, see 7.2.2, "Spool File Formats" on page 159.

For more information about the data flow see 8.1, "PM Queued Printing (PM Applications)" on page 175.

### **7.3.1 Printer/Job Properties**

OS/2 V2.0 now supports over 200 printers. To document each one in terms of printer properties and job properties would require a separate book, especially when you consider that both the OS/2 and WIN-OS/2 aspects of each driver would have to be covered. The good news is that this is already done to an extent because of the contextual help now provided with the OS/2 V2.0 printer drivers. So, what follows in the next two sections is a more generic discussion of the sorts of options included in a fairly complete printer driver, plus highlighted differences for the various printer driver families, such as:

- Epson
- IBM 4019 (includes the 4029)
- IBM 42XX
- IBM 52XX
- IBM/HP Plotters
- LaserJet
- PaintJet
- PostScript.

#### **Printer Properties**

Printer properties, also referred to as printer settings, provide a way of describing the physical setup of your printer to the OS/2 V2.0 operating system. Without this information, the operating system has no way of knowing exactly what printer it has to prepare print data for, what paper is loaded in which tray and what fonts are available. This would present a problem because at some point the print data must be converted into a printer-specific format and so the system must understand your printer configuration in advance of doing this. Otherwise, print options could be selected within your application which may not be supported by your printer setup.

#### **Job Properties**

Job properties are job configuration options which relate only to a particular job in a printer object. The default job properties of a particular printer object will be applied to print jobs directed to this printer object if they don't already have job properties attached to them.

The job property honoring protocol is summarized in Table 6 on page 164.



<i>Table 6. Job Property Honor Protocol vs Print Data Format</i>		
Property	Standard Format Data	Raw Format Data
Resolution	Yes	No
Orientation	Yes	Yes
Default font	Yes	Yes
Compression	Yes	No
Fast system fonts	Yes	No
Form length	Yes	Yes
Form width	Yes	No
Form clipping	Yes	No

#### Note

The choices you make for both printer properties and job properties will be overwritten by applications that permit the specification of job properties on a per-job basis. In this case you must check that the options are chosen correctly within your application; otherwise, errors will result.

Many printer drivers require an application to be involved before the job properties in the printer driver take effect. This requirement is because it is only the newer printers with built-in logic that can handle this type of job setup without an application. One other reason for job properties being ignored is that some printers need specific fonts installed to perform some functions such as landscape.

### 7.3.1.1 Typical Printer Properties

Printer properties options are discussed in this section. Remember that you will find *some* of these options in *all* of the printer properties, but probably not all of them in one.

#### Paper Trays

Some printers are capable of supporting more than one paper source, that is, more than one paper tray. This setting is where you tell the operating system how many paper trays are fitted to your printer.

#### Optional Feeder/Envelope Feeder

If your printer is fitted with an optional feeder then you will need to make a selection here. If you do not then you might not be able to access this feeder through your application or printer job properties.

#### Form Connections/Paper Source

If your printer has more than one paper tray or an envelope feeder or manual feed then this option may appear. Its purpose is to cover the situation where you want to feed different sizes of paper from your paper trays, for example, letter from tray 1 and legal from tray 2. This can be done by associating each tray with a form, and then assigning a form to a printer object. See 5.3.2, "Port with Multiple Printer Objects (Sharing)" on page 113 for a detailed scenario of this.

## Printer Fonts

This option appears within the IBM42XX and IBM52XX printer driver families and has two settings, either **Available** or **Not Available** with the default setting being **Available**. You would select **Not Available** if you were using a printer which was emulating a Proprinter but, maybe, does not have the same resident fonts as the Proprinter. Also the **Not Available** setting can be used to prevent problems with some applications that do not support the large number of device fonts available with the IBM42XX and IBM52XX drivers.

## Font Cards/Cartridges

Many printers support the installation of font cards. These contain additional fonts which supplement the fonts already resident in your printer. This option within printer settings (if present) enables you to tell the printer driver that you have a font card installed. The printer driver will recognize the type of card installed from the selection you make and will then tell the operating system not only that this card is installed but also what fonts are present on it. This information is already known to the printer driver.

## Downloadable Fonts/Soft Fonts

These fonts are typically downloaded to your printer as part of the print job data stream. In the HP LaserJet printer drivers this option is labelled as **Fonts**, and in the IBM Laserprinter drivers this option is labelled **Download Fonts**, which is the same thing by a different name. Downloadable fonts supplement the fonts that are normally in your printer and they can be added and deleted.

## Code Page Memory

This option appears within the IBM42XX and 52XX printer drivers and enables you to inform the operating system whether or not your printer has memory to support code page downloading.

## Code Pages

If your printer has sufficient memory to support code page downloading then this option enables you to choose which code pages you would like to download and when. For example, either at the start of the first print job or on an as-required basis. For more information about code pages, see 4.12, "Code Pages " on page 93.

### 7.3.1.2 Typical Job Properties

Job properties options are discussed in the following section. Remember that you will find *some* of these options in *all* of the job properties, but probably not all of them in one.

## Orientation

There are two choices for orientation:

1. Portrait

This depicts a format that is higher than it is wide, for example, 8.5" wide x 11.0" high, and

2. Landscape

This depicts a format where the width is greater than the height, for example, 11.0" wide x 8.5" high.

Be aware that not all printers have the built-in logic to handle this type of setup. For example, the simple command:

```
COPY AUTOEXEC.BAT LPT1
```

will not automatically result in a printout in landscape mode on the printer object assigned to LPT1, even though landscape orientation is selected in the job properties! For example, the IBM42XX printer driver does not honor the landscape job property request for the above print statement, whereas the IBM 4019/4029 printer driver does because it has a font(s) to do this with. So, if you were printing RAW data to an IBM Proprinter then your application would have to provide the landscape format.

### **Resolution**

This option allows you to vary the resolution of your graphics printing. The selections are usually presented in terms of "dpi," that is, dots per inch. The higher the number then the better quality your print will be. The drawback is that it will also take longer to print. However, you can use a low number for draft output and select the highest number for printing the finished version.

### **Compression**

This option compresses graphic print data which has the advantage of faster printing for most jobs that contain graphics. Two common types of compression are G4 and TIFF Packbit Byte.

**G4** This improves the printing of graphic data that does not have large numbers of alternating bits, for example, large areas that are filled with solid color. G4 is available on all IBM 4029 Laserprinters and IBM 4019 models that support Form Feed Time Out.

#### **Note**

The 4019 models do not support G4 compression when printing in landscape mode.

**TIFF** This improves the printing of graphic data that consists mostly of repeating bytes, for example, large areas having one type of fill pattern.

### **Form/Select Form**

There are lists of defined forms options for each printer, which will vary from one printer to the next. In most drivers you can select one of the forms from the defined list or you can usually add your own custom form. If you choose to add a form then you will have to define the form by entering a name, the size, and the clip limits that will be used.

One example of defining a form would be if you were going to use labels. The printer has to know how long each of the labels is so that it can begin printing at the same point on each successive label.

## Duplex Printing

Some printer drivers allow you to choose between one or two sided printing, that is, printing on just one or both sides of the page. The LaserJet IIID is an example of this. When using these printer drivers, in most cases, the option will be displayed but not selectable as there are not many printers that are capable of this function.

## Default Font

This font selection will be used as the default for raw data print jobs and also for graphics data jobs that do not already have a font selected. The default font may be a font resident in your printer or it may be a system font, that is a font supplied by the operating system.

### Note

PM\_Q\_RAW data jobs cannot use the system fonts and so the printer driver will substitute the first available printer font in your list as the default font.

## Fast System Fonts

For printer drivers which show this option, such as the LaserJet, the default setting is Enabled. This causes system bitmap fonts to be copied to the printer as a device bitmap font. The advantage of this is that a device font uses a smaller spool file and prints more quickly than a font printed in raster form.

If overlaying system bitmap fonts with graphics, or if print output differs from that on the screen, then select the Disable option.

### 7.3.1.3 Generic Printer Driver (IBMNULL.DRV)

The IBMNULL driver is a generic printer driver and it will allow most printers to work with OS/2 to a certain extent. This driver is basically a *pass-through* driver. It allows the applications to set up the print job and the printer driver passes through the job data without making any changes to it. Use this printer driver for a printer that does not have an official OS/2 driver and does not emulate another printer for which there would be an OS/2 driver.

Also, if you want to use a WIN-OS/2 printer driver for which there is no OS/2 equivalent then you should install the IBMNULL printer driver on the OS/2 side and try it with your application.

---

## 7.4 Kernel Device Drivers

OS/2 Version 2.0 provides a number of *physical* device drivers which act as the interface between the operating system and physical devices. Physical device drivers are also referred to as kernel device drivers because they execute in the OS/2 kernel. During the process of sending output to a printer, the printer driver passes commands to the file system which then calls the physical device driver.

Printers usually attach to either parallel (LPTx) or serial (COMx) ports and the device drivers used are:

- PRINT01.SYS for parallel port on non-Micro Channel machines
- PRINT02.SYS for parallel ports on Micro Channel machines
- COM.SYS for serial ports on all machines.

The PRINT0x.SYS device driver is loaded by a BASEDEV statement in the CONFIG.SYS. The OS/2 installation procedure will detect the I/O bus type of the machine on which it is being installed and automatically install the appropriate driver. PRINT0x.SYS supports LPT1, LPT2 and LPT3.

COM.SYS is only installed if serial device support is selected during OS/2 installation. Serial device support can be added at any time by using the OS/2 Selective Install function which is found under **System Setup** in the **OS/2 System** folder. COM.SYS supports COM1, COM2, COM3 and COM4. To use COM3 or COM4 on an AT bus machine, refer to 5.1.3, "COM3/COM4 Support for ISA/EISA Bus" on page 108.

Although they support only three parallel ports using PRINT0x.SYS, and four serial ports using COM.SYS, there is no reason why a greater number of ports cannot be supported. For any other ports a kernel device driver will have to be written. In addition to writing a kernel device driver for the port, a port driver should also be written. The reason for this is that the Workplace Shell support for port configuration is derived from the port driver.

---

## 7.5 Port Drivers

Port drivers provide a set of *helper* functions for use by the Workplace Shell and the OS/2 spooler. Their purpose is to isolate the Workplace Shell and the OS/2 spooler from the different settings required by physical device drivers. A port driver should be provided for each of the physical device drivers used to control printers. A port driver is a DLL with a file extension of .PDR and provides a set of 32-bit functions, which:

1. List the ports the port driver supports, for example LPT1, LPT2 and LPT3
2. Return a pointer to an icon used to represent a port
3. Install a port by writing data for the port to the OS2SYS.INI
4. Display a dialog to allow a user to query and modify a port configuration, and to update the data for the port in the OS2SYS.INI file
5. Initialize a port for use by the spooler, by issuing the appropriate DosDevIOCtl calls to set up the port, based on values contained in the OS2SYS.INI file.

For example, values such as word length, baud rate, parity and number of stop bits will be passed to the physical device driver for a COM port.

The operating system provides two port drivers:

- PARALLEL.PDR corresponding to PRINT0x.SYS
- SERIAL.PDR corresponding to COM.SYS.

For instructions on writing a port driver see *OS/2 2.0 Technical Library Presentation Driver Reference Version 2.0*, Chapter 6, "Port Drivers."

---

## 7.6 Queue Drivers

The queue driver is also often referred to as a queue processor and it is actually a software component within the OS/2 V2.0 operating system. Its function is to take print jobs from the spool queue when they are next in line to print and pass them to part 2 of the printer driver.

If the print data is in the PM\_Q\_STD format then it will be queued on the hard disk as a metafile. In this case, the queue driver will create a presentation space and a device context, and then play the metafile into the presentation space so that the data can be passed on to part 2 of the printer driver. For detailed explanation of part 1 and part 2 of the PM printer driver (PM PDD) see 7.3, "Presentation Manager Printer Drivers" on page 161.

OS/2 V2.0 is shipped with two queue drivers:

1. PMPRINT
2. PMPLOT.

The PMPRINT queue driver will also support plotting in most instances but under special circumstances you may need to use the PMPLOT queue driver. PMPRINT is installed as the default queue driver when you install your system. PMPLOT has to be installed from diskette before it can be used. For the installation procedure, see 2.6.1, "Installing a Queue Driver" on page 39.

Architecturally, the queue drivers can have user definable options, but so far neither PMPRINT nor PMPLOT offer these, and the only options at present are install and de-install.

It is also possible to write your own queue driver in order to satisfy any special needs, for example, to handle a non-standard spool file data format. For more information on this, refer to the PM Programming Toolkit.

### 7.6.1 PMPRINT

PMPRINT.QPR is the file name of the PMPRINT queue driver. This file is located in the \OS2\DLL subdirectory. As conventional printing is normally required, the PMPRINT queue driver is installed as the default at the time of OS/2 V2.0 installation. The queue driver may pass print data without any modification in a raw data format, or it may process the print data so as to become compatible with a specific kind of printing device.

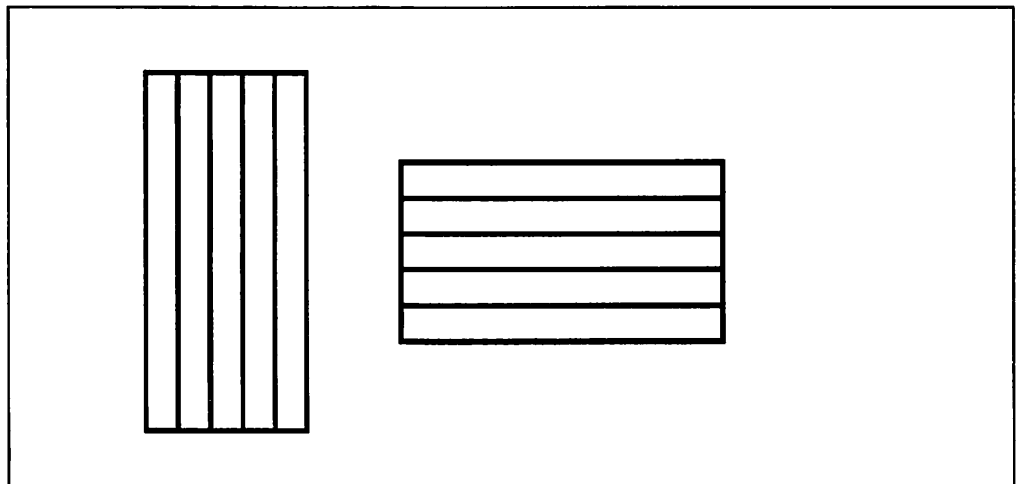
## 7.6.2 PMPLOT

PMPLOT.QPR is the file name of the PMPLOT queue driver. While you're plotting with this queue driver, instead of PMPRINT, you will also be using PMPLOTPD.DRV. PMPLOT.QPR will then communicate with PMPLOTPD.DRV which then communicates with the regular printer driver.

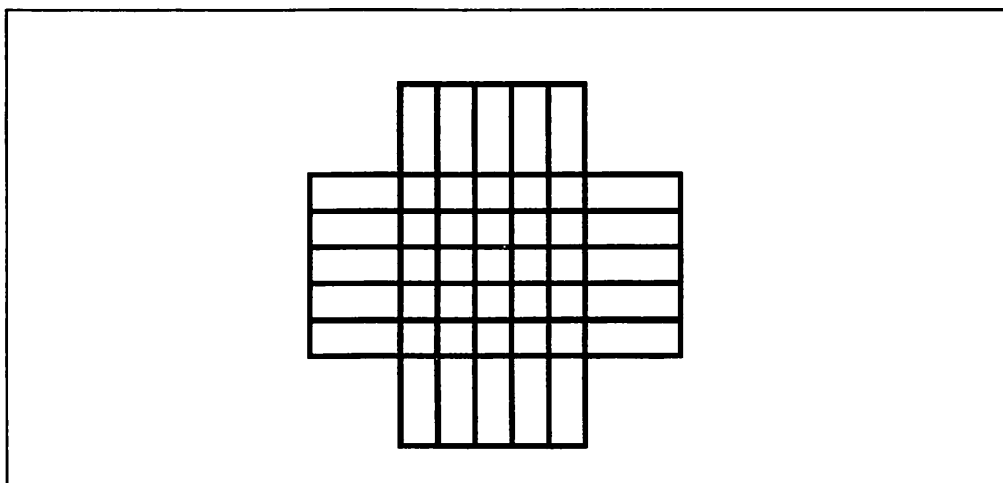
The PMPLOT queue driver is intended for use with vector plotters and can improve the appearance of pictures directed to a plotter by "reverse (or vector) clipping" the data. This method removes hidden lines and patterns from solid objects that overlap in the picture, so that underlying objects are clipped by the overlying ones. The output page created in this way is closer to the screen image of the same file than it would be if PMPRINT is used.

An added advantage of reverse clipping is the reduction in the number of points on the page that are touched more than once by a plotter pen, which will increase the performance of plotting and reduce pen smearing.

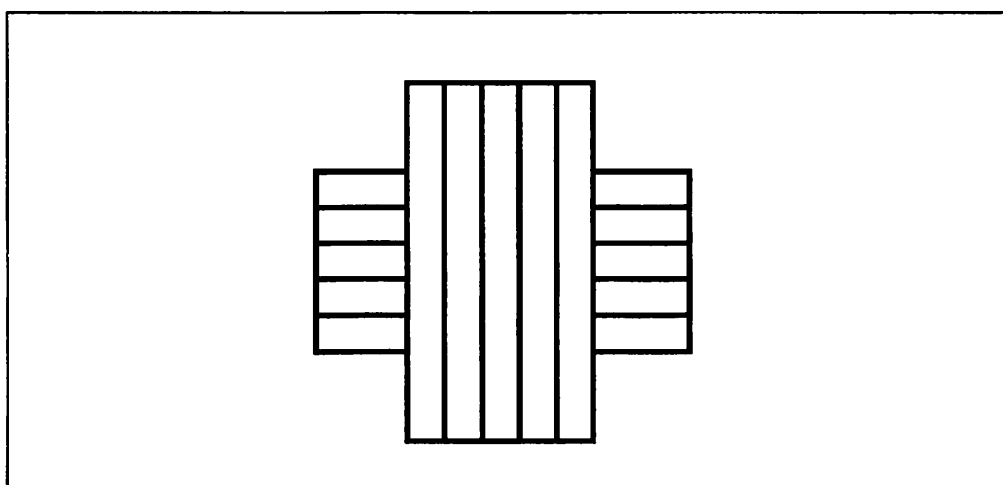
The benefits of reverse clipping are shown in the following three figures. The first figure, Figure 110, shows two filled boxes. If these boxes are drawn over each other without reverse clipping then the result will be that shown in Figure 111 on page 171. However, with reverse clipping, the impression of one solid object overlaying another is accurately represented, as shown in Figure 112 on page 171.



*Figure 110. Two Filled Boxes*



*Figure 111. One Filled Box Overlaying the Other without Reverse Clipping*



*Figure 112. One Filled Box Overlaying the Other with Reverse Clipping*

The quality improvement is achieved by extra processing of the data in the picture. The drawing commands from which the picture is created are processed in the opposite order to that in which they are executed. Objects created last, potentially on top of previous objects, are drawn first. All remaining objects are clipped to the topmost ones. The more complex the picture, the more time required to analyze the data before and during plotting.

**Here are some tips on the use of PMPLOT:**

1. Create a printer object to represent your plotter and assign PMPLOT to this printer object. To do this, refer to Chapter 2, "User Perspective" on page 3.
2. Direct any output that will benefit from the reverse clipping function of PMPLOT to this printer object.
3. Use fill patterns of vertical and horizontal lines, rather than diagonal lines. These are more easily clipped and therefore take less processing time.
4. Pictures without overlapping objects should be sent to a printer object which has the PMPRINT queue driver assigned to it. These do not benefit from the extra processing of PMPLOT and are plotted more quickly through PMPRINT.

**Note:**



- Some applications already have reverse clipping capabilities. If you are using an application with this option, you may get unexpected results using the PMPLOT queue driver.
- PMPLOT may not draw fill patterns the same as PMPRINT and so the patterns may not be the same as those you see on the screen.
- PMPRINT does not support reverse clipping.
- Application developers should be aware that PMPLOT does not reverse clip data that is in PM\_Q\_RAW format. This data is passed directly to the output device.

### **7.6.2.1 PMPLOT and Network Printing**

Even if your application supports "hidden line removal," you may want to use PMPLOT in a network environment. Hidden line removal is a very complex, time consuming process. If left to your application it will severely impact the performance of your local workstation. If you instead send your print job to the server using PMPLOT and do not use your application to do hidden line removal then the queue on the server will be used to "hide"(clip) the lines. This will free your local workstation of the processing and, in most cases, will give you the same result on your plotter.

### **7.6.2.2 Verifying Plotter Installation**

To experience the difference between the two queue drivers, you may want to use the Picture Print utility and plot a rather complex metafile with it. A good sample is the PRTSAMP.MET metafile in the Programmer's Toolkit which has many overlaying areas. Plotting in color using the PMPRINT queue driver produces an unacceptable result whereas plotting using the PMPLOT queue driver produces a much better picture with the sorting and clipping process working as expected.

A simple way of verifying a successful plotter installation is to "drag-and-drop" your STARTUP.CMD file onto your plotter object. If the plotter will actually plot the correct content of this ASCII file, you can assume that your plotter installation is correct.

Even if this test above works correctly for your plotter, you still have to be very careful because the hardware connection is serial rather than parallel and so communications difficulties can easily occur. For example problems have been observed when not using hardware handshake protocol to plot very large metafiles.

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## Chapter 8. Print Subsystem Data Flow

Depending on the application you are printing from, your print data will take one of several different routes through the OS/2 V2.0 print subsystem. This is because different combinations of print subsystem components are required to process print data arriving from different applications. All of the possible data routes from the various supported application types through the print subsystem are shown in Figure 113 on page 174.

This diagram provides a highly detailed view of the entire print subsystem architecture and how the print data moves through it. An administrator may find this information useful as it is always easier to locate the source of a problem when the workings of a system are understood in detail.

Although it may not be apparent from Figure 113 on page 174, the print data flow through the print subsystem can be categorized in three ways, according to the route taken:

- **PM Queued Printing**

Queued printing is the standard method for all PM programs. It provides the most flexibility, both for the application and the user. The characteristic features of PM queued printing are the use of the standard or raw spool file data format and part 1 of the printer driver together with the spooler.

For further information on PM queued printing, see 8.1, "PM Queued Printing (PM Applications)" on page 175.

- **PM Direct Printing**

PM direct printing is characterized by part 1 of the printer driver and the spooler being bypassed and the standard spool file format not being used. Consequently, the application has to wait until the whole job has finished printing before control is passed back to the application.

There are specific reasons for doing this that are beneficial in certain situations which will be discussed later; see 8.2, "PM Direct Printing (PM Applications)" on page 177.

- **Basic Printing**

Basic printing is provided primarily for non-PM programs, including DOS and OS/2 applications (16-bit and 32-bit), plus Windows applications. The characteristic features of basic printing from a data flow perspective are that the standard spool file format and part 1 of the printer driver are never used and only print jobs directed to LPTx ports are queued. Print jobs sent to any COMx port will proceed directly to the kernel device driver.

Basic printing also provides compatibility for family applications or programs running in the DOS compatibility box. These applications usually make use of the standard DosOpen, DosWrite, and DosClose APIs.

For further information on basic printing, see 8.3, "Basic Printing (Non-PM Applications)" on page 178.

### Recommendation

Queued printing should be used in all PM applications.

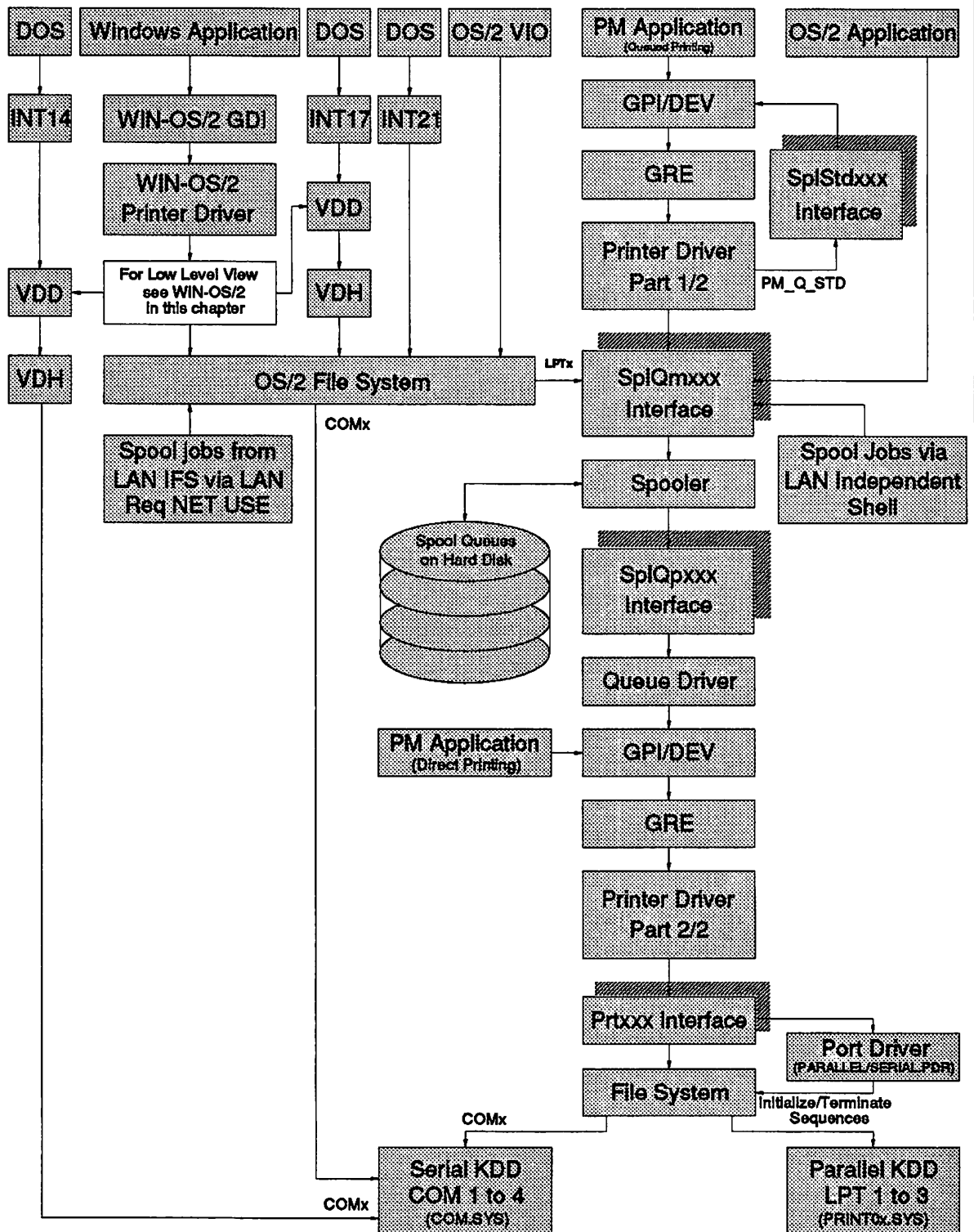


Figure 113. Low Level View of the Entire Print Subsystem Data Flow

---

## 8.1 PM Queued Printing (PM Applications)

A PM application can choose to output print data using either the standard or raw spool file data formats. The standard format is much preferred as it invariably consumes much less disk space than a raw format file and also network traffic is reduced if printing across a LAN.

The data flow for queued PM printing is shown in Figure 114 on page 176.

This process differs for PM\_Q\_STD and PM\_Q\_RAW spool file formats and both are described below. For a detailed, step-by-step description of this flow, see *OS/2 2.0 Technical Library Presentation Driver Reference Version 2.0*, Chapter 4, "Graphics Engine Hardcopy Drivers."

### 8.1.1 PM\_Q\_STD

For this spool file format, the printer driver uses the spooler to create a device-independent spool file by calling on the SplStdxxx and SplQmxxx interfaces. The printer driver uses the services provided through these interfaces by issuing function calls that are understood and are specific to each interface. The interfaces then run routines that act on behalf of the printer driver.

### 8.1.2 PM\_Q\_RAW

For this spool file format, the printer driver uses routines within the PM Graphics Engine (GRE) to generate device-specific output data. It does this by issuing Grexxx function calls which are specific to, and understood by, the GRE. The GRE then runs routines that act on behalf of the printer driver.

The data is spooled (written) to disk using the spooler SplQmxxx interface. As for standard data, the printer driver calls upon the services provided by this interface by issuing function calls which are specific to, and understood by, the SplQmxxx interface.

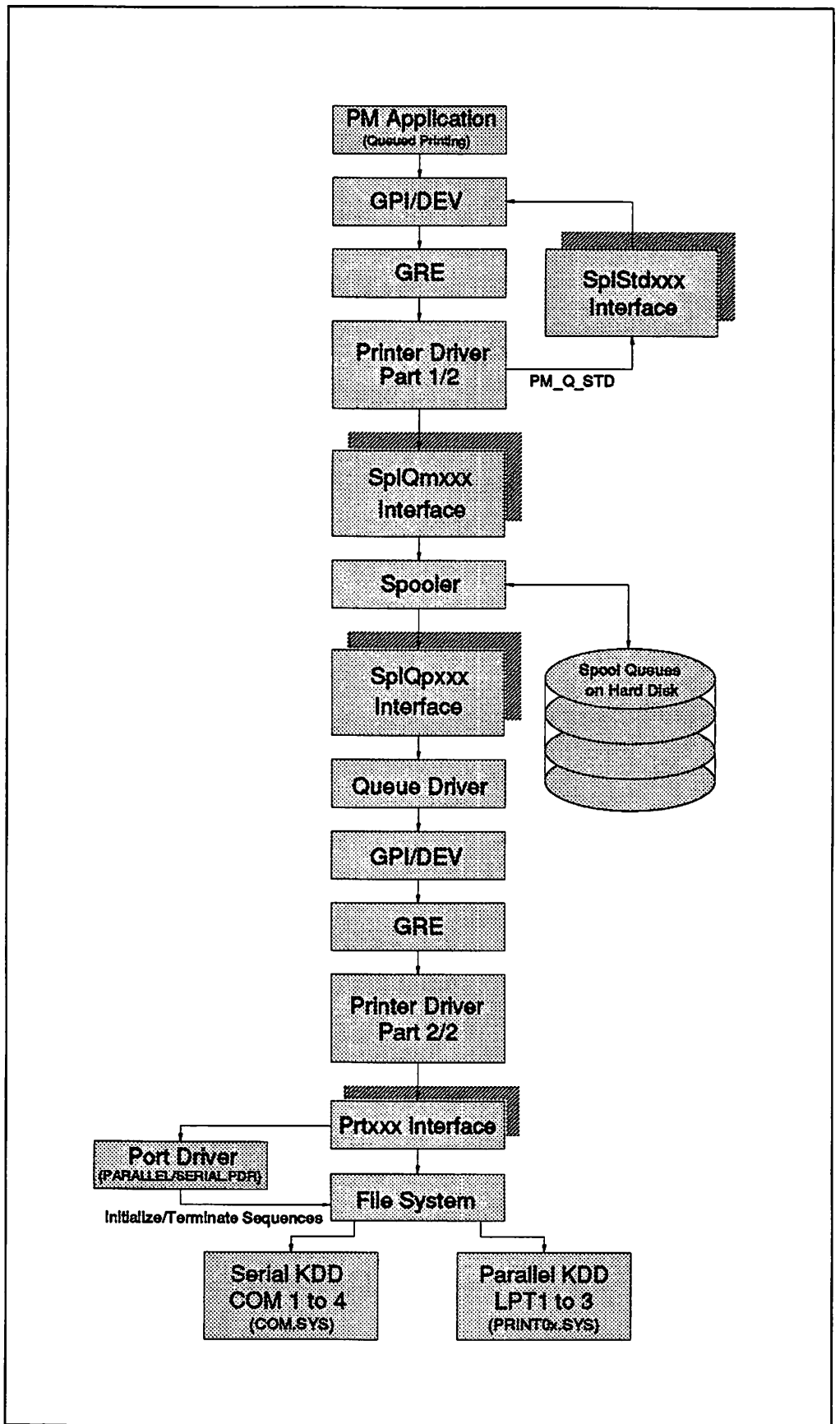


Figure 114. Low Level View of the Queued PM Printing Data Flow

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## 8.2 PM Direct Printing (PM Applications)

Direct PM printing is similar to queued PM printing except that the PM application bypasses part 1 of the printer driver, the spooler and the queue driver. This means that the print jobs created within the direct PM printing environment are not queued, irrespective of whether or not the spooler is enabled.

The data flow for direct PM printing is shown in Figure 115 on page 178.

Direct printing is recommended only for specialized applications that use dedicated hardcopy devices or for high security requirements. Print jobs that have a certain degree of security associated with them, such as payroll or highly confidential documents, may warrant printing using the direct method. The security advantage offered by direct printing is that the print jobs cannot be copied while they are waiting in the spool queues to print.

Also, direct printing may be desirable if you have to regularly print jobs that are so large that they cause problems with hard disk capacity when they are spooled to your hard disk.

There are also several drawbacks to direct printing:

- As the print data is not spooled, you have to wait until the whole job has completed printing until control is handed back to the application so you can productively use it again
- The print job can interfere with other users whose print jobs are also destined for the same printer that you are using; that is, print output from different print jobs could be mixed together
- If a print job which has been previously queued is printing on your printer then you will have to wait until this job has finished until you can begin your print job. The reason for this is that the spooler is involved with the other print job and will only allow one job to print at a time, preventing the queued job from printing.

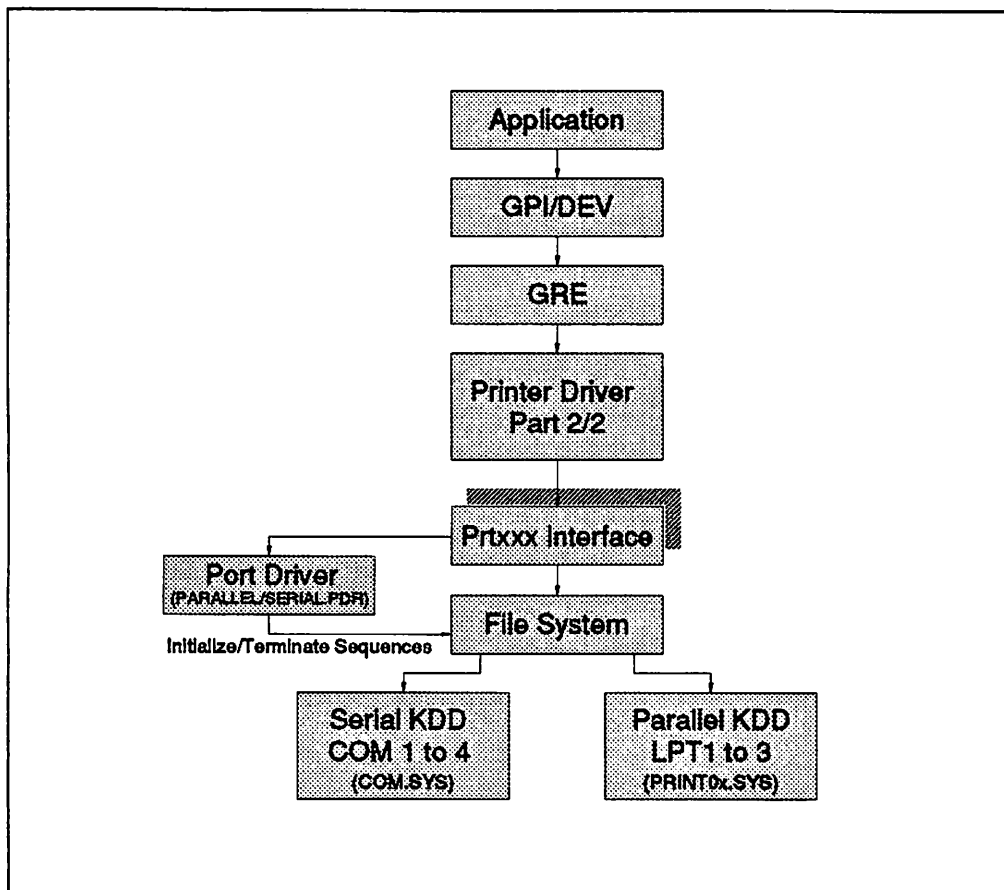


Figure 115. Low Level View of the Direct PM Printing Data Flow

## 8.3 Basic Printing (Non-PM Applications)

All non-PM programs use basic printing. This includes programs running on DOS, OS/2, WIN-OS/2, and also printing commands. These applications can only output their print data in the raw format, that is as a printer-specific data stream that includes the necessary printer commands that can be understood by the printer.

The data flow for basic printing can be broadly categorized into two routes, one for WIN-OS/2 printing and one for other non-PM printing. These routes are discussed separately in the following sections.

### 8.3.1 Non-PM/Non-WIN-OS/2

The data flow for non-PM/non-WIN-OS/2 printing is shown in Figure 116 on page 180.

This data flow applies to all printing that is neither PM nor WIN-OS/2 and covers output generated using Print Screen, applications running on DOS or OS/2, and print commands, such as, COPY or PRINT. All print data, except that from an OS/2 application, arrives at the OS/2 V2.0 file system. The data arrives by different routes depending on the particular source.

A DOS application issuing INT21 or PRINT/COPY accesses the OS/2 V2.0 file system directly whereas a DOS application issuing INT17, INT14 or INT05 cannot.

Instead, an INT14 or INT17 calls on a VDD (Virtual Device Driver) which is specific to the port destination selected in the application, that is, VLPT.SYS for LPTx ports (INT17), or, VCOM.SYS for COMx ports (INT14). The virtual device driver cannot call on the services of the OS/2 V2.0 operating system directly and consequently calls on a VDH (Virtual Device Helper) to do this on its behalf. The OS/2 V2.0 file system is then accessed via the VDH. The choice of interrupt is transparent to the spooler. The handling of INT17 and INT21 is shown in Figure 117 on page 181.

If you perform a *print screen* from within a VDM, the system calls the CBIOS INT05. This will also be trapped within the OS/2 kernel and routed to the virtual device drive VLPT.SYS and eventually print on LPT1.

There is one major function of the file system which must be noted here and that is the way it intercepts jobs directed to LPTx ports and passes them on to the OS/2 spooler via the SplQmxxx interface. This does not happen for jobs directed to COMx ports, which pass through the file system directly to the serial kernel device driver. This is true for DOS INT17/INT21, OS/2 applications, Print Screen and also the print commands. Jobs directed to the COMx ports are not spooled.

Once beyond the file system, print jobs sent to LPTx ports are processed in the same way as raw data sent from a PM queued application; see 8.1, "PM Queued Printing (PM Applications)" on page 175.

OS/2 applications can bypass the file system and call on the SplQmxxx interface directly. The important consequence of this is that jobs directed to COMx ports can be spooled. The SplQmxx interface uses queue names, not ports, when queueing.

Redirected print jobs from LPTx to COMx are also spooled prior to printing on a serial printer.



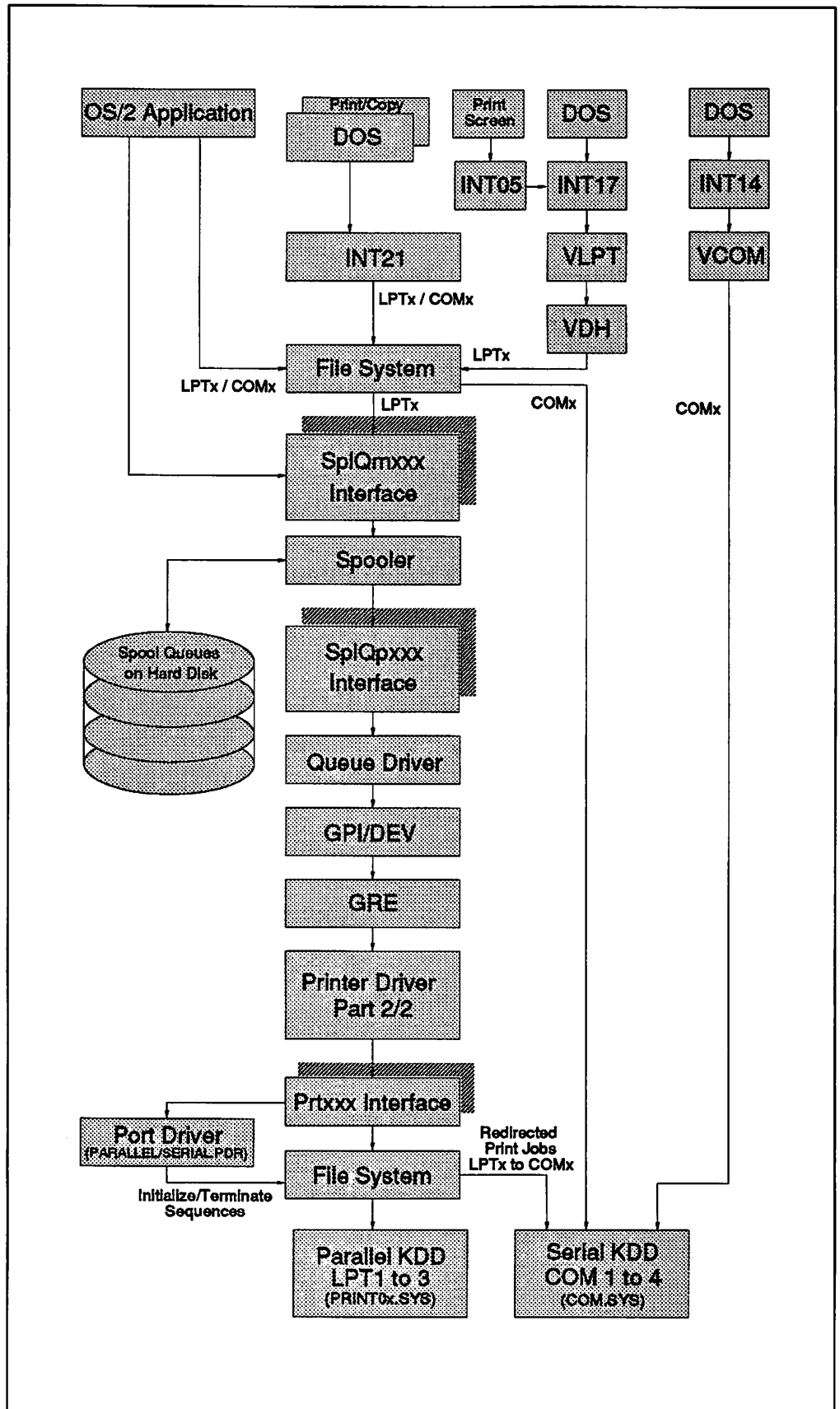


Figure 116. Low Level View of the Non-PM/Non-WIN-OS/2 Printing Data Flow

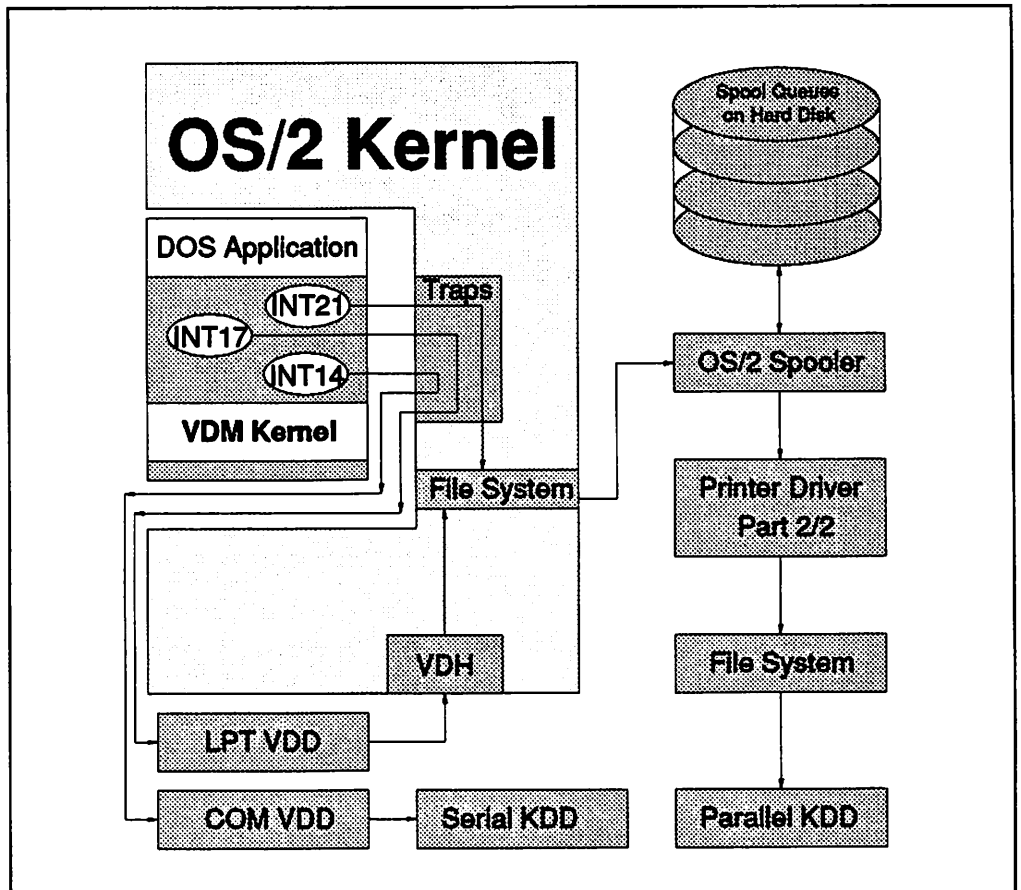


Figure 117. OS/2 V2.0 Handling of INT14, INT17 and INT21 Interrupts

### 8.3.1.1 Printing from the Command Prompt

This is actually the first thing every OS/2 user can do, even without having any other application installed. This will also be a method of printing if your application only provides some kind of an output file instead of supporting the print subsystem directly.

Basic printing supports the following print commands:

- Copy
- > (Redirection)
- Print
- Spool.

The print data generated from these print commands is in the raw format. For more information about print data formats, see 7.2.2, "Spool File Formats" on page 159.

#### **COPY**

The COPY command causes a job to be spooled that will show the file name in the description field and is basically one of several ways of directing print output to a particular port.

For example:

COPY C:\CONFIG.SYS LPT1:

In this scenario, a logical port is addressed and the file system tries to find that port for the user.

On the LAN you could also use any available printer by addressing it directly via its remote name.

For example:

`COPY CONFIG.SYS \\servername\printer remote name.`

- > (Redirection)** Redirecting output to a physical or logical port using the ">" command will also cause printing. This job will appear as a file titled "System."

For example:

`DIR > LPT1:`

or,

`TYPE CONFIG.SYS > LPT2:`

In a single workstation the logical ports are usually mapped to match the physical ports and that is where the output goes. A network and its definitions may map any logical port to any physical port. The user of the redirection command has to be aware of this so that they do not start searching for the printout in the wrong place.

#### **Warning**

Print data sent to LPTx ports using the COPY and ">" commands is intercepted by the file system and is passed to the spooler. However, this does NOT happen for print jobs sent to COMx ports. Instead, the file system passes the print data directly to the serial kernel device driver.

For more information about the file system, see 7.1, "File System" on page 156.

For more information about kernel device drivers, see 7.4, "Kernel Device Drivers" on page 168.

#### **PRINT**

The PRINT command supports ports LPT1 to LPT9 but does not support COMx ports. Print data generated via the PRINT command will be spooled if you have defined a print object that uses that particular LPT port.

If you don't want your "raw" print data to be spooled, just make sure no printer object is defined for the particular LPT port. This might be useful in cases where an application wants to "talk" directly to a parallel port.

If no port is specified then the PRINT command directs the print data to LPT1.

The command syntax is:

`PRINT CONFIG.SYS /D:LPT1`

## **SPOOL**

The SPOOL command enables the user to redirect print output from one logical port to another logical port.

For example:

```
SPOOL /D:LPT1 /O:COM1
```

### **Recommendation**

Historically, the SPOOL command was the only way of redirecting one port to another within the earliest versions of OS/2.

However, in OS/2 V2.0, port redirection can be done through the Output settings within the printer object and this is a better way to do it.

Therefore, there is actually no need to use the SPOOL command to redirect ports but it is still available and supported for compatibility reasons. Some users may also like to use it because they are used to it from OS/2 V1.x systems and/or have a preference for command line operations.

Similarly, in a network environment the SPOOL command should NOT be used because the printer and port assignments are made with the network definitions.

### **8.3.1.2 Print Screen**

This function is available for all sessions except WIN-OS/2 full screen sessions. The command is not typed in from a command prompt but, instead, is executed by pressing a key on your keyboard.

The data can either be ASCII or bitmap, depending on the source. The queued spool files can be viewed and edited using either the picture viewer or the text editor, depending on the data type.

Print screens from the Workplace Shell will go to the default printer. Print screens for a full screen session will always go to the LPT1 port by default, provided that a printer is defined to LPT1. If LPT1 is undefined then complications can occur. The screen content can easily be sent to a different port by redirecting the output using the procedures outlined in 2.4.5, "Redirecting a Local LPT Port" on page 33. The data flow characteristics of the Print Screen function are summarized in Table 7 on page 184. For information on how print screens work from a user perspective see 6.4, "Getting the Most Out of Print Screens" on page 151.

<i>Table 7. Print Screen Data Flow vs Source</i>					
Source	Bitmap / ASCII	Spool File Format	LPT1 Defined	LPT1 redirected to COM1	LPT1 Undefined
OS/2 Full Screen	ASCII	PM_Q_RAW	Spooled to LPT1	Spooled to COM1	Direct to LPT1
OS/2 Window	Bitmap	PM_Q_STD	Spooled to default	Spooled to default	No Output
DOS Full Screen	ASCII	PM_Q_RAW	Spooled to LPT1	Spooled to COM1	Direct to LPT1
DOS Window	Bitmap	PM_Q_STD	Spooled to default	Spooled to default	No Output
3270 Session	Bitmap	PM_Q_STD	Spooled to default	Spooled to default	No Output

### 8.3.2 WIN-OS/2

For WIN-OS/2 printing, raw print data is generated via the WIN-OS/2 printer driver and GDI (Graphical Device Interface). The WIN-OS/2 printer driver directs the data to the appropriate port but the data route then taken varies depending on whether or not the OS/2 spooler is enabled, as shown in Figure 118 on page 185.

If the OS/2 spooler is enabled, an INT21 is issued which provides a direct path for the print data to come into the OS/2 V2.0 file system. (The OS/2 V2.0 handling of the INT17 and INT21 interrupts is shown in Figure 117 on page 181.) Jobs directed to LPTx or LPTx.OS2 ports are intercepted by the file system and are sent on to the SplQmxxx interface. The print data is then processed by the print subsystem as though it were raw data arriving from a PM queued application; see 8.1, "PM Queued Printing (PM Applications)" on page 175. Note that for this scenario, the print data is processed by the WIN-OS/2 printer driver and also part 2 of the equivalent OS/2 printer driver.

#### Note

It is important to ensure that the WIN-OS/2 and OS/2 printer drivers match to avoid conflict between them. If you use a WIN-OS/2 driver which has no OS/2 equivalent then use the IBMNULL driver.



Print jobs directed to COMx ports are not intercepted by the file system as for LPTx/LPTx.OS2 ports. Instead, they are passed directly to the serial kernel device driver.

If the OS/2 spooler is disabled then the print data bypasses many of the print subsystem components. In this scenario, if the WIN-OS/2 spooler is enabled it will be called upon to spool the print job, which is actually written to the root directory of your hard disk. The queued spool files are distinguished by having the file extension .TMP. If the WIN-OS/2 spooler is also disabled then the print job passes straight through to the kernel device driver.

With the OS/2 spooler disabled, there are three routes that print jobs can take, according to their port destination:

1. A job directed to a COMx to be printed, the WIN-OS/2 spooler passes the print job to the COM VDD (Virtual Device Driver). The reason for this is that the job will ultimately be printed through the OS/2 serial KDD (Kernel Device Driver) which is COM.SYS.
2. Jobs directed to LPTx are routed to the virtual printer driver, then through the parallel KDD to the parallel hardware.
3. Jobs directed to LPTx.OS2 are routed to the parallel KDD through the INT21 interface and file system.

#### **Recommendation**

We strongly recommend you to operate the print subsystem with both spoolers enabled; otherwise, print data from different jobs may become mixed up. Also, you will have to wait for your jobs to completely finish printing before you can use your application again.

---

## Chapter 9. System Files

This chapter describes the system files which are relevant to the operation of the print subsystem. They are grouped into two categories, OS/2 and WIN-OS/2.

---

### 9.1 OS/2 System Files

The complexity of OS/2 demands the customization of run-time parameters for the operating system itself as well as the customization of the user interface, such as colors, object positions, window positions, printer assignments and settings. OS/2 uses several files to manage this process and they are discussed in the following sections.

In addition to the operating system standard .INI files there may be application-specific .INI files. Applications can build and maintain their own .INI file, using the Prf APIs. The contents of application-specific .INI files cannot be accessed by other applications or system components. For more information see 9.3, "Generating Application Initialization Files" on page 193.

#### Warning

With the exception of the CONFIG.SYS file, you should treat the system files discussed in this chapter as "black boxes" and leave them alone. As some of them are binary files, you can't edit them! Even the CONFIG.SYS, should only be edited if you have very good reason to and are an experienced user.

#### 9.1.1 CONFIG.SYS

This ASCII file sets the basic operating parameters for the operating system. The contents can be changed during run time but the changes do not come into effect until you perform a system restart. The CONFIG.SYS file should be changed only by an experienced user.

#### 9.1.2 STARTUP.CMD

In addition to the Startup folder in the OS/2 System container, this ASCII file holds all system initialization commands. After installation of the base OS/2 V2.0 this file doesn't exist. The system, however, will search for it in the root directory of the boot partition and will execute the commands in it, if it has been created by the user or an application. This is the place where the user can specify how the system should come up when restarted. In general this includes all valid OS/2 commands. For example one can start Communications Manager, the LAN services, logon to the LAN and a host, redirect output and much more.

#### 9.1.3 OS2.INI

This is a binary file that is created during the installation of OS/2 containing information about System Settings such as application defaults, display options, file options and print options. It is vital for the operating system and must not be deleted or renamed.

As it is not an ASCII file, the contents are not meant to be manipulated by a user directly. Instead, the contents can be modified through the use of API functions provided by the operating system, by application programs or by special utilities.



So you cannot just simply list the contents of the file but you have read/write access to practically all entries through the Prf APIs and Spl APIs.

You can change the information about printing, contained in the OS2.INI file, through the printer settings notebook, for example, the information about the default printer object. For more information on *printer settings* see 2.2.4, "Configuring a Local Printer Object" on page 11.

**Important**

Even though this file is not to be manipulated by the user it is a good idea to have a backup of it in its most recent modification level. For more details see 9.2.2, "How to Back Up OS2.INI" on page 190.

The OS2.INI is complementary to the OS2SYS.INI so if either of these files becomes corrupted restore or rebuild both of them!

#### 9.1.4 OS2SYS.INI

This is a binary file which can only be accessed by applications through the Prf APIs and Spl APIs. Hardware definitions and hardware assignments such as port assignments are stored in this system-oriented file. As in OS2.INI the contents regarding printing are created and/or modified through the printer settings notebook. Most of the printer information is stored in this profile, except for the default printer object and PM fonts which are stored in the OS2.INI. Much of what was said for OS2.INI is true for OS2SYS.INI too. The main difference is that this file contains *system*-related information such as:

1. Installed printer drivers
2. Printer driver settings
3. Spooler assignments
4. Queue driver usage
5. Port assignments.

Both .INI files belong together and have direct dependencies on each other. If one is corrupted it is highly recommended that you replace both of them at the same time. This is done either by restoring a working backup version, or by rebuilding them from scratch. If you have to rebuild from scratch then most of the configuration details such as printer definitions, program entries, colors, communication parameters, window positions, and some application parameters will be lost.

Fully conforming PM applications put their operating parameters into these files and query their contents using the APIs. That ensures the coordination of all printing.

#### 9.1.5 Printer Entries in OS2.INI and OS2SYS.INI

The following is a specially formatted dump of some complementary entries in the OS2.INI and OS2SYS.INI. It is meant to give you an idea of what kind of information is stored. Some of the information is strictly binary and is seen as data structures by programs that access this data.

```

[PM_ControlPanel]
[BorderWidth] 4
[LogoDisplayTime] 2880
[PrintScreen] 1
[Animation] 0000 01 00 00 00
.....

[PM_DEVICE_DRIVERS]
[IBMNULL] E:\OS2\DLL\IBMNULL\IBMNULL.DRV
[IBM4019] E:\OS2\DLL\IBM4019\IBM4019.DRV
[IBM42XX] E:\OS2\DLL\IBM42XX\IBM42XX.DRV
.....

[PM_Font_Drivers]
[PMATH] \OS2\DLL\PMATH.DLL
.....

[PM_Fonts]
[SYSMONO] \OS2\DLL\SYSMONO.FON
[COURIER] \OS2\DLL\COURIER.FON
[HELV] \OS2\DLL\HELV.FON
[TIMES] \OS2\DLL\TIMES.FON
[HELVETIC.PSF] \OS2\DLL\HELVETIC.PSF
[COURIER.PSF] \OS2\DLL\COURIER.PSF
[TIMESRM.PSF] \OS2\DLL\TIMESRM.PSF
.....

[PM_AbstractObjects]
0070 00 00 03 00 07 00 00 00 .....
0070 50 72 69 6E 74 65 72 00 Printer.
0080 02 00 05 00 04 00 00 00 .....
.....

[PM_Workplace:Templates]
[WPRPrinter:124586:Printer] 1
[WPRPrinter:99224:Network Printer]
.....

[PM_MP_ASSOC_TYPE]
[Printer-specific] 0000 00
.....

[PM_SPOOLER]
[PRINTER] LAN4019;
[QUEUE] LAN4019;
[SPOOL] 0;
[DIR] E:\SPOOL;
.....

[PM_PrintObject:JobCnrPos]
[672501]
0000 6A 7B 0F 10 00 00 9A 01 j{.....
0000 57 00 E7 09 6A 00 01 00 W...J...
0010 00 00 9A 01 57 00 E7 00 ....W...
.....

[PM_SPOOLER_QP]
[PMPRINT] E:\OS2\DLL\PMPRINT.QPR;;
[PMPL0T] E:\OS2\DLL\PMPL0T.QPR;;
.....

[PM_SPOOLER_QD]
[IBM42XX.IBM 4201 Proprinter] IBM42XX.DRV;;
[IBM4019.IBM 4019 LaserPrinter] IBM4019.DRV;;
.....

[PM_SPOOLER_PORT]
[LPT1] ;
[LPT2] ;
[LPT3] LPT1;
[COM1] 9600;0;0;1;1;
[COM2] 9600;0;0;1;1;
[COM3] 9600;0;0;1;1;
[COM4] 9600;0;0;1;1;
[FILE] ;
.....

[PM_SPOOLER_QUEUE_DESCR]
[LPT1Q] ;
[Printer]
0000 49 42 4D 34 32 30 31 20 IBM4201
0000 00 0A 50 72 6F 70 72 00 ..Proprl
0010 0E 74 65 72 30 00 nter;.
[LAN4019] LS:\LANSRV2\LAN4019;
.....

[PM_SPOOLER_QUEUE_QD]
[LPT1Q] IBMNULL;
[Printer] IBM42XX.IBM 4201 Proprinter;
[LAN4019] IBM4019.IBM 4019 LaserPrinter;
[LANPOSTQ] PSCRIPT.IBM Personal Page Printer II-31;
[LAN3012] IBM5152;
.....

[PM_SPOOLER_QUEUE_QDDATA]
[LPT1Q]
;
[Printer]
0000 FC 00 00 00 01 02 00 00 .....
0000 49 42 4D 20 34 32 30 31 IBM 4201
0010 20 50 72 6F 70 72 60 0E Proprin
0010 74 65 72 00 00 00 00 00 ter.....
0070 00 00 4C 65 74 74 65 72 ..Letter
0080 20 20 30 2A 35 20 70 20 (0*5 x
0080 31 31 20 09 6E 03 00 05 11 inche
0090 73 29 00 00 00 00 00 00 s).....
0090 00 00 00 50 49 00 00 00 ...PI...
00A0 00 00 00 00 00 00 00 .....
00A0 00 00 00 00 00 00 00 .....
00B0 00 00 00 00 00 4C 65 74 .....Let
00B0 74 65 72 20 20 30 2A 35 ter (0*5
00C0 20 70 20 31 31 20 09 6E x 11 in
00C0 63 00 65 73 29 00 00 00 ches)....

[LAN4019]
0000 FC 00 00 00 01 02 00 00 .....
0000 49 42 4D 20 34 30 31 39 IBM 4019
0010 20 4C 61 73 65 72 50 72 LaserPr
0010 69 6E 74 65 72 00 00 00 Inter...
0070 00 00 4C 65 74 74 65 72 ..Letter
0080 20 20 30 2A 35 20 70 20 (0*5 x
0080 31 31 20 09 6E 03 00 05 11 inche
0090 73 29 00 00 00 00 00 00 s).....
0090 00 00 00 50 49 00 00 00 ...PI...
00B0 00 00 00 00 4C 65 74 .....Let
00B0 74 65 72 20 20 30 2A 35 ter (0*5
00C0 20 70 20 31 31 20 09 6E x 11 in
00C0 63 00 65 73 29 00 00 00 ches)....
00D0 00 00 00 00 00 00 50 49 .....PI
.....

[PM_SPOOLER_PRINTER_DESCR]
[PRINTER1] ;
[Printer] Printer;
[Printer1] Printer;
[LAN4019] LS:\LANSRV2\LAN4019;
.....

[PM_Objects]
[ClassTable]
0030 00 00 00 57 50 50 72 69 ...WPPri
0040 6E 74 65 72 00 57 50 50 nter.WPP
0040 52 49 4E 54 00 10 00 00 RINT....
0050 00 10 00 00 00 57 50 53 .....WPS
0050 70 6F 6F 6C 00 57 50 50 pool.WPP
0060 52 49 4E 54 00 15 00 00 RINT....
0060 00 0F 00 00 00 50 44 56 .....PDV
0070 69 65 77 00 57 50 53 50 iev.WPSP
0070 4C 00 10 00 00 00 13 00 L.....
0080 00 00 57 50 52 50 72 69 ..WPPPri
0080 6E 74 65 72 00 57 50 50 nter.WPP
0090 52 49 4E 54 00 14 00 00 RINT....
00B0 57 50 50 72 60 6E 74 65 WPPrinte
00B0 72 44 72 60 76 65 72 00 rDriver.
00C0 50 4D 57 50 00 10 00 00 PMMP....

[PRINT_NEW_OBJECTS]
[CSOLEVEL] XR02800_
[DATA] 1;
.....

[PM_Workplace:Handles]
[BLOCK1]
0000 00 50 52 44 52 56 2E 4C .PRDRV.L
0090 53 54 00 4E 4F 44 45 01 ST.NODE.
0090 00 DC A1 46 70 00 00 00 ...F{...
00A0 00 00 00 44 50 49 00 44 ...DX1.0
00A0 50 49 00 2C 01 51 00 00 XI...0..
00B0 00 0C 00 4C 41 53 45 52 ...LASER
00B0 4A 45 54 2E 44 52 56 00 JET.DRV.
00C0 4E 4F 44 45 01 00 00 0E NODE....
00E0 49 42 4D 35 32 30 31 32 IBM52012
00E0 2E 44 52 56 00 4E 4F 44 .DRV.NOD
.....

[PM_SPOOLER_PRINTER]
[Printer] LPT1;IBM42XX.IBM 4201 Proprinter;Printer;45;
[Printer1] LPT2;IBM42XX.IBM 4201 Proprinter;45;
[LAN4019] IBM4019.IBM 4019 LaserPrinter;LAN4019;45;

[PM_LPT1]
[TIMEOUT] 45;
[DESCRIPTION] LPT1
[TERMINATION] ;
[INITIALIZATION] ;
[PORTDRIVER] PARALLEL;

[PM_LPT.....]
[PM_PORT_DRIVER]
[PARALLEL] E:\OS2\DLL\PARALLEL.PDR
[SERIAL] E:\OS2\DLL\SERIAL.PDR

[PM_COM1]
[DESCRIPTION] COM1
[TERMINATION] ;
[INITIALIZATION] 9600;0;0;1;1;
[PORTDRIVER] SERIAL;
[TIMEOUT] 45;

[PM_COM.....]
.....

[PM_QD_Printer,SHGXPJET.Paintjet XL]
[DRIVERDATA]
0000 50 61 69 6E 74 6A 65 74 Paintjet
.....

[PM_SPOOLER_QUEUE]
[Printer] PMPRINT;;
[LAN4019] PMPRINT;;

[PM_SPOOLER_QUEUE_STATUS]
[Printer] 1,5,0,0,
[LAN4019] 0,5,0,0,

[PM_SPOOLER_QUEUE_TYPE]
[LAN4019] NOBYPASS;

[PM_SPOOLER_QUEUE_COMPUTER]
[LAN4019] LS:\LANSRV2;

[PM_SPOOLER_QUEUE_REMOTENAME]
[LAN4019] LAN4019;
.....

```

---

## 9.2 Backup and Restore with the Workplace Shell

The Workplace Shell stores a great deal of critical data in the OS/2 initialization file OS2.INI and in extended attributes associated with data files and directories. The OS2.INI file contains system details such as the pointers for all the abstract objects - shadows, program references, etc. A more detailed discussion of what the Workplace Shell stores in OS2.INI may be found in "*OS/2 Version 2.0 - Volume 3: Presentation Manager and Workplace Shell*", GG24-3732.

To prevent corruption of these files you must get in the practice of using Shut-down before you turn off your system. If, however, this information is lost or corrupted for any reason, the effect on the system can be very serious. Backing up only the contents of data files is, therefore, no longer sufficient. Backing up OS2.INI has gained critical importance.

This section discusses approaches to backup and restore that will allow a user to recover from system failures in such a way that his desktop environment is not disrupted too badly. It also discusses some of the more popular backup utilities in terms of their suitability for backing up a system using the Workplace Shell.

### 9.2.1 Critical System Files

OS/2 V2.0 has a built-in mechanism for restoring the three critical system files: CONFIG.SYS, OS2.INI and OS2SYS.INI.

During boot, if you press ALT-F1 before the CONFIG.SYS file is read (the best time is when disk access begins), the system will use neither the CONFIG.SYS file found in the root nor the OS2.INI and OS2SYS.INI files found in the \OS2 directory. These versions of the CONFIG.SYS and .INI files are renamed with a numeric extension such as CONFIG.003 or OS2.015.

The system then replaces these files with versions of the CONFIG.SYS and the .INI files that are stored in the \OS2\INSTALL subdirectory. A message informs the user of what occurred and the system continues its IPL. This method prevents you from having to reinstall OS/2 but it also returns the Workplace Shell to its initial installed condition.

This mechanism works well for replacing existing copies of these files while preserving the old version in case the new one generates system errors. We have also discussed other approaches, below, which may offer additional flexibility.

### 9.2.2 How to Back Up OS2.INI

The OS2.INI file is kept open by the WPS at all times, so normal backup techniques cannot be used - the back-up programs will be denied access to the file because it is already open. One solution that we have found useful is to copy this file during the operating system boot *before the Workplace Shell has started*.

It is not sufficient to make only one copy; if you do that, and corrupt OS2.INI, the next time you boot the system your corrupted file will overwrite the backup. It may even be that you do not know you have a problem until after the re-boot, by which time you have lost your backup.

The solution to this is to make a series of generation backups of OS2.INI, by using XCOPY from within CONFIG.SYS and some RENAMES from within

STARTUP.CMD. Since these backup files are not used by the system they may be backed up to tape or another disk just like any other data files. Although the critical WPS data is held in OS2.INI, it is worth backing up OS2SYS.INI in the same way.

This is illustrated in the following figures.

```
RUN=C:\OS2\XCOPY.EXE C:\OS2\OS2*.INI C:\SAFE
```

Figure 119. Starting XCOPY in the First Line of CONFIG.SYS to Back Up \*.INI Files

```
REM *** Build Backup History ***
C:
CD\SAFE
ERASE OS2.OLD
RENAME OS2.3 OS2.OLD
RENAME OS2.2 OS2.3
RENAME OS2.1 OS2.2
RENAME OS2.INI OS2.1
ERASE OS2SYS.OLD
RENAME OS2SYS.3 OS2SYS.OLD
RENAME OS2SYS.2 OS2SYS.3
RENAME OS2SYS.1 OS2SYS.2
RENAME OS2SYS.INI OS2SYS.1
CD\
REM *** That's all folks ... ***
```

Figure 120. Building Backup History of the INI Files from STARTUP.CMD

This scheme keeps five versions of the INI files on disk, .OLD being the oldest. If something happens to an INI file you still have a chance of reverting to a previous version. The space occupied by the backups depends on the size of your INI files and the number of cascaded copies you make; from 500 KB to several MB of disk space can be used up. You must make your own judgement as to the number of generations to keep, based on the size of the files concerned and the available disk space.

### 9.2.3 Restoring a Backup Version of OS2.INI

If you should be so unfortunate as to lose or corrupt the OS2.INI file, you will want to restore it from the most recent, clean, backup copy you have. This will normally be the one that was copied when you last booted the system.

Since OS2.INI is kept open at all times by the Workplace Shell, you cannot simply copy the backup over the current file. The following procedures will allow you to do this.

#### 9.2.3.1 Reboot from Diskette

This procedure will only recover your system to the point at which it was previously saved. Any objects and folders that you added since that point will be lost, as will any colors and desktop settings which you altered.

Booting from diskette to restore the OS2.INI file requires the following steps:

Step 1. Obtain the OS/2 V2.0 Installation Diskette and Diskette 1

- Step 2. Insert the OS/2 V2.0 Installation Diskette and reboot
- Step 3. When prompted, insert Diskette 1 and press Enter. Wait for the first Install panel and press Escape for an OS/2 command prompt
- Step 4. Copy your saved INI files into the bootup drive and directory:
- ```
COPY A:\*.INI C:\OS2
```
- Step 5. Remove the diskette and reboot.

### 9.2.3.2 System Install from ALT-F1

The ALT-F1 keystroke combination, described in 9.2.1, "Critical System Files" on page 190 will copy the CONFIG.SYS, OS2.INI and OS2SYS.INI files from the OS2\INSTALL directory into the appropriate directories before reading those files. A more detailed discussion of this technique may be found in *OS/2 Version 2.0 - Volume 1: Control Program*.

### 9.2.3.3 MAKEINI

The MAKEINI utility generates a new OS2.INI and a new OS2SYS.INI file from the resource files shipped with the system. The resource files containing the data required to build the default initialization files are INI.RC. for OS2.INI and INISYS.RC for OS2SYS.INI. They can be found in the \OS2 directory.

If you run the following steps the .INI files will be restored as they were when OS/2 V2.0 was first installed:

1. Boot the OS/2 V2.0 install diskette
2. At the system logo screen press the **ESC** key
3. Type **C:**
4. Type **CD \OS2**
5. Type **Erase OS2.INI** if the OS2.INI file is corrupt
6. Type **Erase OS2SYS.INI** if the OS2SYS.INI is corrupt
7. Type **MAKEINI OS2.INI INI.RC** to rebuild OS2.INI
8. Type **MAKEINI OS2SYS.INI INISYS.RC** to rebuild OS2SYS.INI
9. Restart the system.

**Note:** Remember that the new initialization information will have been reset to the default settings for OS/2.

This is also discussed in more detail in *OS/2 Version 2.0 - Volume 3: Presentation Manager and Workplace Shell*.

### 9.2.3.4 What Is the Effect of Restoring a Backlevel OS2.INI?

If you have to restore an old OS2.INI to an otherwise intact system, there may be conflicts between the contents of OS2.INI and the files, directories and EAs on the disks. The degree of problems caused will depend on how many program files have been copied and how many shadow copies have been made since the date that the OS2.INI file was copied. This is because these objects are stored in the OS2.INI file and will be lost when it is replaced.

The usual problem that ensues is that a folder will have a pointer to that program or copy in its directory EA, but now the pointer no longer exists. The solution is easy; perform a refresh on the folder, then copy the program or file shadow again.

### 9.2.4 Backup Programs

The backup programs PMTAPE and Sytos Plus\*\* for OS/2 are capable of backing up the main system files (CONFIG.SYS, OS2.INI and OS2SYS.INI) as well as the directories, files and their associated EAs.

---

## 9.3 Generating Application Initialization Files

The MAKEINI utility can be used to generate a new initialization file for use by an application. This would be of use to an application that is required to save setup configuration information.

The format of the data file read by MAKEINI is important. First of all a dummy heading, which consists of 10 empty strings, is required. Following that are the profile entries, with each entry corresponding to three strings. The first defines the application name, the second defines the key name, and the third defines a string of data related to the key name. For example:

```
CODEPAGE 850      /* INI File Codepage      */

STRINGTABLE
BEGIN
    /* The following header MUST be present  */
    "" "" "" "" "" "" "" "" "" "" ""

    /* Contents of INI file follow format is : */

    /* app name      Key Name      Data      */
    "MY_APPLICATION" "POSITION"    "x=0,y=0,cx=100,cy=100"
    "MY_APPLICATION" "DIRECTORY"   "C:\MYAPP\DATA"

    "" "" ""      /* Empty Delimiter      */
END
```

Figure 121. Sample Resource File MYAPP.RC

If the above information is in a file called MYAPP.RC, then the command to generate the profile would be:

```
MAKEINI MYAPP.INI MYAPP.RC
```

---

## 9.4 Accessing Initialization Files with APIs

OS/2 V2.0 introduces 32-bit Spl APIs to be able to get all the information you need about the print configuration of the system. You should refer to the *PM Programming Reference Volume 1*, for details on how to access this information.

---

## 9.5 Extended Attributes for PM Printer Drivers

This section describes a very specific way that extended attributes are used on the printer driver support diskettes of OS/2. Though extended attributes (EAs) are not new to OS/2 there is a growing use of them. This means that users of previous versions of OS/2 who were mainly ignoring the EAs should now be

aware of their existence. So far, you may have gotten away with copying OS/2 files using DOS, which does not know of the EAs. Some programs, however, rely on the information that is stored as an extended attribute. Extended Attributes are also discussed in more detail in *OS/2 Version 2.0 - Volume 3: Presentation Manager and Workplace Shell*.

When you install a printer driver the installing program does not just copy a file from diskette to disk. Many drivers depend on other components such as a DLL, in order to run. This information is stored in the \*.EA file for every single printer driver that needs this kind of information on the device support diskette (FAT file system), for example, LASERJET.EA, PSCRIPT.EA, EPSON.EA and IBM4019.EA. The OS/2 installation procedure uses this information to pull in the other required components. Printer driver EAs are discussed in detail in *OS/2 2.0 Presentation Driver Reference*.

---

## 9.6 WIN-OS/2 System Files

When WIN-OS/2 support is selected during installation of OS/2 V2.0, WIN-OS/2 .INI and .INF files are built. The options for devices selected for the OS/2 environment are included in these files.

Should the user migrate from a DOS/Windows V3.0 environment, the original \*.INIs created by Windows V3.0 will be left unchanged. Modified copies of these files will be placed into the \OS\MDOS\WINOS2 subdirectory.

Printer definitions for the WIN-OS/2 environment will depend on the OS/2 V2.0 setup, rather than on any previously defined printer device driver. Of course, all path statements in these files will be modified to point to the appropriate directories. Backups of these files should be taken prior to making any changes to this environment.

These files and their contents are described in the following sections. They are also discussed in more detail in *OS/2 Version 2.0 - Volume 2: DOS and Windows Environment*.

### 9.6.1 WIN.INI

This is an ASCII file located in the \OS2\MDOS\WINOS2 subdirectory, which may be customized by the user. You should be very careful when applying any changes to this file, especially when it comes to configuring any of the printer drivers. Changes made in this file are not effective until you restart your WIN-OS/2 session(s).

Most, but not all, Windows applications also have their private entries in this file, some of them register even all their installation dependent configuration information, and may therefore be very dependent upon finding their data there. The WIN.INI contains the following information about your system:

- Printer definitions
- Spooler status
- Spooler options
- Port configurations
- Application directories
- Application file extensions
- Available system fonts
- Other aspects of WIN-OS/2 configuration.

If you install fonts in ATM (Adobe Type Manager) or the printer drivers, soft font entries are also added to WIN.INI.

The following figure shows you some keywords and attributes in WIN.INI that are necessary for printing. This is to give you an idea of what kind of information is stored there, but is *not* a complete listing of a WIN.INI file.



```

[windows]
Spooler=yes
NullPort=None
device=IBM Laser Printer 4019,IBM4019,LPT1.OS2:
DeviceNotSelectedTimeout=15
[ports]
; A line with [filename].PRN followed by an equal sign causes
; [filename] to appear in the Control Panel's Printer Configuration dialog
; box. A printer connected to [filename] directs its output into this
file.
LPT1:=
LPT2:=
LPT3:=
COM1:=9600,n,8,1
COM2:=9600,n,8,1
COM3:=9600,n,8,1
COM4:=9600,n,8,1
EPT:=
FILE:=
LPT1.OS2=
LPT2.OS2=
[fonts]
Symbol 8,10,12,14,18,24 (VGA res)=SYMBOLE.FON
Helv 8,10,12,14,18,24 (VGA res)=HELVE.FON
Courier 10,12,15 (VGA res)=COURE.FON
Tms Rmn 8,10,12,14,18,24 (VGA res)=TMSRE.FON
Roman (All res)=ROMAN.FON
Script (All res)=SCRIPT.FON
Modern (All res)=MODERN.FON
[IBM4019]
Orient=0
Size=00
Res=0
Feeder=1
Dload=0
Family=00000000000000000000000000000000
Mode=0
Width=00
Height=00
Feed=0
Printer=0
Option=0
RasterFonts=0
[PrinterPorts]
IBM Laser Printer 4019=IBM4019,LPT1.OS2:,15,45
[devices]
IBM Laser Printer 4019=IBM4019,LPT1.OS2:
IBM 4029 v52.3(17 Fonts,300 Dpi)=PSCRIPT,LPT3:
[PSCRIPT]
External Printers=1
Printer1=40291760
[spooler]
priority=medium
inactivealert=always
DisplayTime=yes
[PostScript,LPT3]
device=6
feed1=

```

Figure 122. Sample Extract from WIN.INI

## 9.6.2 SYSTEM.INI

This file contains the global system information used by WIN-OS/2 when it starts. It contains configuration information about printer drivers and fonts and is used during system startup. Changes made in this file are not effective until WIN-OS/2 is restarted.

The following figure shows you some keywords and attributes necessary for printing in the SYSTEM.INI. This is not a complete listing but it gives you an idea of what kind of information is stored.

```
[boot]
system.drv=atmsys.drv
atm.system.drv=system.drv
MAVDMApps=!gpm,!clipos2,!ddeagent,!printman
```

*Figure 123. Sample Extract from SYSTEM.INI*

### 9.6.3 PROGMAN.INI

This is an ASCII file which contains the Windows Program Manager settings and information relating to your WIN-OS/2 program groups, such as your Main and Accessories groups. If you install a Windows application through a WIN-OS/2 session then you will see the application program group listed in this file. PROGMAN.INI is located in the \OS2\MDOS\WINOS2 subdirectory.

### 9.6.4 ATM.INI

This ASCII file is located in the \OS2\MDOS\WINOS2 subdirectory. It contains details of the ATM fonts you have installed and your ATM setup options, such as, whether ATM is on or off, font cache size and whether to use prebuilt or resident bit map fonts.

### 9.6.5 CONTROL.INI

This ASCII file contains the color and desktop settings for the Windows Control Panel.

### 9.6.6 DRVMAP.INF

This is an ASCII file which is located in the \OS2\MDOS\WINOS2\SYSTEM subdirectory and consists of more than 100 mapping statements, one for each particular printer model listed. The function of the DRVMAP.INF file is to map the OS/2 printer drivers to their WIN-OS/2 equivalents.

A sample extract from the file is shown in the following figure.

```
HPPCL5.HP Laserjet III=HP LaserJet III
HPPCL5.HP Laserjet IIID=HP LaserJet III
HPPCL5.HP Laserjet IIIP=HP LaserJet III
HPPCL5.HP Laserjet IIISi=HP LaserJet III
IBM3852=IBM Color Printer
IBM4019.IBM 4019 LaserPrinter E=IBM Laser Printer 4019
IBM4019.IBM 4019 LaserPrinter=IBM Laser Printer 4019
IBM4019.IBM 4029 LaserPrinter 10=IBM Laser Printer 4019
IBM4019.IBM 4029 LaserPrinter 10L=IBM Laser Printer 4019
IBM4019.IBM 4029 LaserPrinter 5E=IBM Laser Printer 4019
IBM4019.IBM 4029 LaserPrinter 6=IBM Laser Printer 4019
```

*Figure 124. Sample Extract from DRVMAP.INF*

This file is referenced when you install a printer driver in OS/2. If the printer driver you installed is listed in DRVMAP.INF then the system asks you if you want to install the equivalent WIN-OS/2 printer driver.

## 9.6.7 SETUP.INF

This ASCII file contains the names of the diskettes that *Setup* can prompt for, together with a list of printer driver file names, followed by a descriptive string which appears in the Control Panel and the WIN.INI file, and 1 or 2 strings which indicate the scaling for the device. Each of these entries is shown against the number of the diskette that contains the particular printer driver file. There are cases when a printer driver file is listed more than once because it supports more than one printer.

A sample extract concentrating especially on data about printing stored in this file is shown in the following figure.

```
; Names of the disks Setup can prompt for.
[DISKS]
1 =. "Insert Printer Driver Diskette 1 ",PMDD 1
2 =. "Insert Printer Driver Diskette 2 ",PMDD 2
3 =. "Insert Printer Driver Diskette 3 ",PMDD 3
4 =. "Insert Printer Driver Diskette 4 ",PMDD 4
5 =. "Insert Printer Driver Diskette 5 ",PMDD 5
6 =. "Insert Printer Driver Diskette 6 ",PMDD 6
7 =. "Insert Printer Driver Diskette 7 ",PMDD 7
8 =. "Insert Printer Driver Diskette 8 ",PMDD 8
9 =. "OS/2 Installation Diskette #9 ",disk9
A =. "OS/2 Installation Diskette ",diskA

[IO.DEVICE]
; (printers, plotters, etc.)
; The filename is followed by
;
; -- the descriptive string which will appear in Control Panel and
;    which will appear in WIN.INI
; -- 1 or 2 strings indicating the scaling for this device
;
; There may be more than one line for a driver, corresponding to different
; printers.

3:IBM4019.DRV,"IBM Laser Printer 4019","DEVICESPECIFIC"
3:IBM4020.DRV,"IBM Laser Printer 4020","DEVICESPECIFIC"
3:IBM4072.DRV,"IBM 4072","DEVICESPECIFIC"
4:CANON111.DRV,"Canon LBP-8111/LBP-4","DEVICESPECIFIC"
4:HPPLLOT.DRV,"HP DraftPro [HP Plotter]","CONTINUOUSSCALING"
4:NEC24pin.DRV,"NEC PinWriter P9XL [NEC Pinwriter]","100,360,360","100,120,120"
4:PAINTJET.DRV,"HP PaintJet Series","100,100,100","100,120,120"
4:PSSCRIPT.DRV,"IBM 4019 v52.1 (17 fonts)","DEVICESPECIFIC"

[IO.DEPENDENT]
CANON111.DRV= 3:GENDRV.EXE
DESKJET.DRV= 3:FINSTALL.DLL, 3:FINSTALL.HLP, 4:DESKJET.HLP
HPPCL.DRV= 3:FINSTALL.DLL, 3:FINSTALL.HLP, 3:HPPCL.HLP
HPPCLSA.DRV= 3:FINSTALL.DLL, 3:FINSTALL.HLP, 3:HPPCL.HLP
IBM4019.DRV= 3:SF4019.EXE, 3:GENDRV.DLL
IBM4020.DRV= 3:SF4019.EXE, 3:GENDRV.DLL
PAINTJET.DRV= 4:PAINTJET.HLP, 4:CR12RPA.PJF, 4:L012RPA.PJF, 4:L008RPA.PJF
PSSCRIPT.DRV= 4:PSSCRIPT.HLP, 3:IBM17521.WPD, 3:IBM39521.WPD, 3:40291730.WPD, 3:40291760.WPD, 3:40293930.WPD, 3:40293960.WPD
;
```

Figure 125. Sample Extract from SETUP.INF

SETUP.INI is located in the \OS2\MDOS\WINOS2\SYSTEM subdirectory.

## 9.7 IBMLAN.INI

This ASCII file sets the basic LAN-relevant parameters and is located in the C:\IBMLAN\ subdirectory, which is only created when you install LAN Requester. The contents can be changed during run time but the changes do not come into effect until a LAN restart. It deserves a quick mention from the printing angle because the print buffer time is stored here. There is normally no need to change from the default value of 90 seconds. For more information see Chapter 3, "LAN Environment" on page 55.

---

## 9.8 Summary

Within several system files in OS/2 V2.0 there is information stored regarding printing from the OS/2 and the WIN-OS/2 environments. Some of these files can be edited by an experienced user and some can be only inspected by APIs used in OS/2 programs.

As these files are vital for running OS/2 V2.0 and the imbedded WIN-OS/2 environment, it is strongly recommended, to have backups available. In addition OS/2 V2.0 provides services to have it back up and running when some of these files are corrupted without being forced to reinstall the whole system.

...the ... of ...  
...the ... of ...  
...the ... of ...

...the ... of ...  
...the ... of ...  
...the ... of ...

---

## Appendix A. Separator Page Definitions and Macros

The following list shows the escape codes which can be used in separator page files and the functions they perform.

| <b>Code</b> | <b>Function</b> |
|-------------|-----------------|
|-------------|-----------------|

|                     |                                                                                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>@Ltext</b>       | Prints the specified text.                                                                                                                                  |
| <b>@0</b>           | Ends a line. You must specify where you want lines to end when the separator page is printed. Use after @Ltext, that is @Ltext@0.                           |
| <b>@D</b>           | Prints the date when the spool file was created.                                                                                                            |
| <b>@T</b>           | Prints the time when the spool file was created.                                                                                                            |
| <b>@N</b>           | Prints the submitter's name and a user or machine ID.                                                                                                       |
| <b>@I</b>           | Prints the print queue ID number for the file.                                                                                                              |
| <b>@Q</b>           | Prints the queue description and queue name.                                                                                                                |
| <b>@Hnn</b>         | Sets printer-specific control sequence, where <i>nn</i> is a hexadecimal number sent directly to the printer. These control sequences are printer-specific. |
| <b>@F"filename"</b> | Prints the file. For example, this could be used to set up printer defaults.                                                                                |
| <b>@Wnn</b>         | Sets separator page width in characters. Range is from 1 to 132.                                                                                            |
| <b>@n</b>           | Skips <i>n</i> number of lines. Range is from 0 to 9.                                                                                                       |
| <b>@B</b>           | Creates block characters.                                                                                                                                   |
| <b>@S</b>           | Creates single-width block characters. Use after the @B code.                                                                                               |
| <b>@M</b>           | Creates double-width block characters. Use after the @B code.                                                                                               |
| <b>@U</b>           | Turns off block-character printing.                                                                                                                         |
| <b>@E</b>           | Ejects a page from the printer. Used to start a new page or end the separator page.                                                                         |

OS/2 V2.0 ships with two separator page definitions. They are PSCRIPT.SEP and SAMPLE.SEP and are located in the \OS2 folder. In the following sections we show a few additional sample definition files, to give you an idea of what is possible and how to code towards any printer specific environment.

Note that the first line in each file is an "@" This describes the escape character that you are using for the file. In our examples we used "@" but you could use something else such as the "#" character. The point is that whatever you use must be defined in the first line.

## A.1 General Separator Page Sample Definition File

```
@
@2
@H0E@U@H12@L IBM ITSC Boca Raton, Florida@0
@1@U@H12@L Token Ring LAN / OS/2 V1.3@0
@2@U@H12@L Domain : ITSCBOCA@0
@1@U@H12@L Sever : LAN Server 2 (LANSRV2)@0
@1@U@H12@L Printer : IBM 4019@0
@2@U@H12@L Date : @D@0
@1@U@H12@L Time : @T@0
@1@U@H12@L Job-ID : @I@0
@1@U@H12@L LAN User : @N@0
@1
@B@S@L @N@U@0
@E
```

*Figure 126. Separator Page Definition File, General Sample*

This sample will run on most "normal" printers like the IBM Proprinters, Quietwriters, Quickwriters, IBM 4019 Laser Printer in native mode, etc. It will also run on the IBM 4216-020, because the DGA device monitor will realize that this is not a PostScript file and will therefore treat it like any normal print job for its Proprinter emulation. This approach won't work on the IBM 4216-031 because there is no intelligent emulation-switch software which would do the trick. In this case, the printer would try to interpret it as a PostScript data stream and therefore it would print nothing!

## A.2 Separator Page Definition for the IBM 3812 Page Printer

```
@
@H1B@H57@H00
@H1B@H54
@H12
@H1B@H37
@H1B@H41@H0C@H1B@H32
@H1B@H46@H1B@H48
@H1B@H41@H0C@H1B@H32
@H1B@H45
@1
@L          IBM Internal Use Only@@
@L          Unless Indicated Otherwise@@
@L          in the Following Document@@
@1
@B@S@L IBM ITSC@U@@
@L          Boca Raton, Florida@@
@L          Token Ring LAN / OS/2 EE V1.3@@
@2@L Domain : @H1B@H45@LITSCBOCA@H1B@H46@@
@1@L Server : @H1B@H45@LLANSRV2@H1B@H46@@
@1@L Printer : @H1B@H45@LIBM 3812@H1B@H46@L in IBM 5152 Emulation@@
@2@L Date : @H1B@H45@D@H1B@H46@@
@1@L Time : @H1B@H45@T@H1B@H46@@
@1@L Job-ID : @H1B@H45@I@H1B@H46@@
@1@@
@U@H1B@H57@H01@L User-ID:@@
@H1B@H57@H00
@1@S@@
@N@@
@1
@U@@
@U@H1B@H57@H01@L Don't worry, be happy ...@L
@H1B@H57@H00
@H1B@54
@H12
@H1B@H37
@H1B@H5B@H43@H14@H00@HF7@H0A@H00@H10@HD1@H40@H90@HF7@H20
@H00@H07@HF7@H0A@H00@H03@HD1@H00@H90@HDA@H20
@H1B@H46@H1B@H48
@E
```

Figure 127. Separator Page Definition File, Sample for IBM 3812

Notice that this separator page definition file contains some very tricky macro programming for the IBM 3812 Page Map Primitive Commands. It will switch the printer into its IBM 5152 emulation mode, get the separator page from the second paper tray, print it and print the rest of the print job on the paper found in the first paper tray. All of this without the typical and annoying empty extra page.



## A.3 Separator Page Definition for the IBM 3816 Page Printer

```
@
@H1B@H5B@H4B@H05@H00@H05@H34@H80@H02@H02
@W72 /* set page width          above sets simplex, 12 pitch
@H1B@H5B@H4B@H03@H00@H00@H00@H02 /* Print from bin 2 of 3816 printer
@H1B@H6B                          /* Portrait
@H1B@H6C                          /* Landscape
@4
@L      *****@
@L      *****@
@L      *****@
@L      *****@
@L      *****@
@L      *****@
@L      *****| T      @
@L      *****| |      @
@L      *****| * |      @
@L      *****| |      @
@L      ****  ***|      @
@L      **   **|      @
@L      *****@
@L      *****@
@L      ***@
@L      **@
@4
@L This wood pulp created by: @
@B@S@L @N@U
@3
@L Printed at.....: @T@L on: @D
@3
@L Print Spooler Queue Number: @I
@H1B@H5B@H4B@H03@H00@H00@H00@H01 /* Print from bin 1
@E
```

Figure 128. Separator Page Definition File, Sample for IBM 3816

## A.4 Separator Page Definition for the IBM 4216 Personal Page Printer II

Since the IBM 4216 can be switched into several different emulation modes, we will show you different separator pages for this printer, depending on which mode the user has set it to.

### A.4.1 PostScript Mode

```
@
@L/v 760 def@
@L/n{/v v 40 sub def 72 v moveto}def@
@L/fs{/Helvetica findfont exch scalefont setfont}def 80 fs@
@L/s{show}def /p{s n}def /u{p n}def /t{statusdict begin setpapertray end}def@
@L%1 t@
@Ln n(@N @L) u 20 fs@
@L(ITSC Boca Raton, Florida) u (Printer: IBM 4216-031) p@
@L(File Queue ID: @I @L) u (Print Date: @D @L) p (Print Time: @T @L) u@
@L(\\(C\\) Copyright IBM Corporation 1987,1989) s showpage@
```

Figure 129. Separator Page Definition File, Sample 1 for IBM 4216 in PostScript Mode

Notice the totally different style in this separator page. It is actually a complete PostScript command sequence. That means you could create anything you want on your separator page by using the available PostScript commands, which are far more powerful than the normal separator page macros.

The following is just another sample of a PostScript separator page.

```
@
@L/name(
@N
@L) def
@L/jobid (
@I
@L) def
@L/date (
@D
@L) def
@L/time (
@T
@L) def
@L100 0 {dup mul exch dup mul add 1 exch sub} setscreen
@L2 setlinewidth 2 setmiterlimit
@L/inch {72 mul} def
@L/White 1 def
@L/Black 0 def
@L/Gray .9 def
@Lnewpath clippath closepath pathbbox
@L/ury exch def
@L/urx exch def
@L/lly exch def
@L/llx exch def
@L/PrintWidth urx llx sub def
@L/PrintHeight ury lly sub def
@L/CenterString {
@L/str exch def /width exch def
@Lwidth str stringwidth pop sub 2 div 0 rmoveto
@Lstr
@L} def
@L/Helvetica findfont .2 inch scalefont setfont
@L1 inch 10 inch moveto
@L(Date: ) show date show
@LPrintWidth 2 inch sub 10 inch moveto
@L(Time: ) show time show
@L/Helvetica-Bold findfont 1 inch scalefont setfont
@Lnewpath
@Lllx PrintHeight 3 inch sub moveto
@LPrintWidth name CenterString true charpath
@Lllx PrintHeight 4.5 inch sub moveto
@LPrintWidth jobid CenterString true charpath
@Lclosepath
@Lgsave
@LGray setgray fill
@Lgrestore
@Lstroke
@Lshowpage
@E
```

*Figure 130. Separator Page Definition File, Sample 2 for IBM 4216 in PostScript Mode*

Now, these tricky separator pages would not work on the IBM 4216-020 with the DGA device monitor if the dynamic emulation switch is active. The monitor is parsing the first few characters of the input file for the “%%” sequence. Since it doesn’t find it in here, it would print this file like a normal text file, which

wouldn't show the expected results of course. To solve this problem you could either modify this separator page or use a "generic" one.

## A.4.2 HP LaserJet Mode

```
@
@H1B@L&10o1D@H1B@L(0U@H1B@L(s1p1h70v0s0b4T
@LIBM@0
@L4216-031@H1B@L(s3h24V@H1B@L&13D@0
@2
@LData Stream: LaserJet IIP@0
@2
@LLAN User ID: @N@0
@LFile Queue ID: @I@0
@2
@LPrint Date: @D@0
@LPrint Time: @T@0
@2
@LIBM ITSC Boca Raton@0
```

*Figure 131. Separator Page Definition File, Sample for IBM 4216 in HP LaserJet Mode*

Notice again the slightly different style in this separator page. It contains a small HP Page Control Language (PCL) sequence.

---

## **Appendix B. Printer Drivers Shipped with OS/2 V2.0**

---

### **B.1 OS/2 Printer Drivers**

#### **PRINTER DRIVER DISKETTE #1**

##### **IBMNULL.DRV**

IBM NULL Printer Driver

##### **LASERJET.DRV**

Epson EPL-7000  
HP LaserJet 2000  
HP LaserJet Classic  
HP LaserJet 500 Plus  
HP LaserJet IID  
HP LaserJet III  
HP LaserJet IIID  
HP LaserJet IIIP  
HP LaserJet IIISi  
HP LaserJet IIP Plus  
HP LaserJet IIP  
HP LaserJet Plus  
HP LaserJet Series II  
IBM 4019 Laserprinter E  
IBM 4019 Laserprinter  
IBM 4029 Laserprinter 10  
IBM 4029 Laserprinter 10L  
IBM 4029 Laserprinter 5E  
IBM 4029 Laserprinter 6  
Kyocera F-1000A/F-1000  
Kyocera F-1800A/F-1800  
Kyocera F-2000A/F-2200S  
Kyocera F-3000A/F-3300  
Kyocera F-5000A/F-5000  
Kyocera F-800A/F-800  
Kyocera F-820  
Panasonic KX-P4420  
Panasonic KX-P4450  
Panasonic KX-P4450i

##### **PSCRIPT.DRV**

AST TurboLaser  
Agfa Matrix ChromaScript v51\_8  
Agfa-Compugraphic 9400PS v49\_3  
Agfa/Compugraphic 400PS  
Apple LaserWriter II NT  
Apple LaserWriter II NTX  
Apple LaserWriter Plus v42\_2  
Apple LaserWriter Plus  
Apple LaserWriter  
Colormate PS v51\_9  
Dataproducts LZR 1260 v47\_0

Dataproducts LZR-2665  
 Digital LN03R ScriptPrinter  
 Digital LPS PrintServer 40  
 Epson EPL-7500 v52\_3  
 Generic PostScript Printer  
 HP LaserJet IID v52\_2  
 HP LaserJet III v52\_2  
 HP LaserJet IIID v52\_2  
 HP LaserJet IIIP PS v52\_2  
 HP LaserJet IIISi PS v52\_3  
 HP LaserJet IIP v52\_2  
 IBM 4019 v52\_1 (17 Fonts)  
 IBM 4019 v52\_1 (39 Fonts)  
 IBM 4029 (17 Fonts 300 Dpi)  
 IBM 4029 (17 Fonts 600 Dpi)  
 IBM 4029 (39 Fonts 300 Dpi)  
 IBM 4029 (39 Fonts 600 Dpi)  
 IBM 4216-031 v51\_4 SheetFeed  
 IBM Personal Page Printer II-30  
 IBM Personal Page Printer II-31  
 IBM Personal Pageprinter  
 Kyocera P-2000  
 Kyocera Q-8010  
 Linotronic 100 v38\_0  
 Linotronic 100 v42\_5  
 Linotronic 200 v47\_1  
 Linotronic 200 v49\_3  
 Linotronic 300 v47\_0  
 Linotronic 300 v47\_1  
 Linotronic 300 v49\_3  
 Linotronic 500 v49\_3  
 NEC LC-890  
 Olivetti LP 5000  
 Panasonic KX-P4455 v51\_4  
 Phaser Card v1\_1  
 QMS ColorScript 100 Mod 10  
 QMS ColorScript 100 Mod 30  
 QMS ColorScript 100 Mod 30si  
 QMS ColorScript 100  
 QMS IS X320T  
 QMS-PS 1500  
 QMS-PS 2000  
 QMS-PS 2200  
 QMS-PS 2210  
 QMS-PS 2220  
 QMS-PS 410  
 QMS-PS 800 Plus  
 QMS-PS 800  
 QMS-PS 810 Turbo  
 QMS-PS 810  
 QMS-PS 815 MR  
 QMS-PS 815  
 QMS-PS 820 Turbo  
 QMS-PS 820  
 QMS-PS 825 MR

QMS-PS 825  
Qume ScriptTEN  
Seiko ColorPoint PS Model 04  
Seiko ColorPoint PS Model 14  
Seiko Personal ColorPoint PS  
Silentwriter LC 890XL v50\_5  
Silentwriter2 290 v52\_0  
Silentwriter2 Model 90 v52\_2  
TI 2115 (13 fonts) v47\_0  
TI OmniLaser 2108  
TI Omnilaser 2115  
TI microLaser PS17 v\_52\_1  
TI microLaser PS35 v\_52\_1  
Tektronix Phaser II PX v2\_02  
Tektronix Phaser II PXi v2010  
Tektronix Phaser III PXi v2010  
Varityper VT-600  
Wang LCS15 FontPlus  
Wang LCS15

## **PRINTER DRIVER DISKETTE #2**

### **IBM4019.DRV**

IBM 4019 LaserPrinter E  
IBM 4019 LaserPrinter  
IBM 4029 LaserPrinter 10  
IBM 4029 LaserPrinter 10L  
IBM 4029 LaserPrinter 5E  
IBM 4029 LaserPrinter 6

### **IBM42XX.DRV**

IBM 2380 PPS II  
IBM 2381 PPS II  
IBM 2390 PPS II  
IBM 2391 PPS II  
IBM 4201 Proprinter II  
IBM 4201 Proprinter III  
IBM 4201 Proprinter  
IBM 4202 Proprinter II XL  
IBM 4202 Proprinter III XL  
IBM 4202 Proprinter XL  
IBM 4207 Proprinter X24  
IBM 4207 Proprinter X24E  
IBM 4208 Proprinter XL24  
IBM 4208 Proprinter XL24E  
IBM 4224 - 01 & 02 & E3  
IBM 4224 - C2  
IBM 4226 Model 302

### **PRINTER DRIVER DISKETTE #3**

#### **IBM52012.DRV**

IBM 5201 Quietwriter II

#### **IBM52XX.DRV**

IBM 3816 - 01D

IBM 3816 - 01S

IBM 5202 QuietWriter III

IBM 5204 QuickWriter

#### **SMGXPJET.DRV**

HP Paintjet

HP Paintjet XL

### **PRINTER DRIVER DISKETTE #4**

#### **EPSON.DRV (for all countries)**

Epson 24 pins - 136 columns

Epson 24 pins - 80 columns

Epson 9 pins - 136 columns

Epson 9 pins - 80 columns

Epson DFX-5000

Epson EPL-6000 Laser

Epson EX-1000 Color

Epson EX-800 Color

Epson FX-1050

Epson FX-850

Epson JX-80 Color

Epson LQ-1050

Epson LQ-1170

Epson LQ-2500 Color

Epson LQ-2550 Color

Epson LQ-500

Epson LQ-570

Epson LQ-850

Epson LQ-860 Color

Epson LQ-870

Epson LX-800

HP DeskJet 500

Panasonic KX-P1123

Panasonic KX-P1124

Panasonic KX-P1124i

Panasonic KX-P1180

Panasonic KX-P1191

Panasonic KX-P1624

Panasonic KX-P1654

Panasonic KX-P1695

Panasonic KX-P2624

#### **EPSON.DRV (for US only)**

Epson LX-810

Epson FX-286e

Epson DFX-8000

Epson LQ-510  
Epson LQ-1010  
Epson LQ-850 (N9)  
Epson LQ-950 (N9)  
Epson LQ-1050 (N9)

**EPSON.DRV (for foreign countries only)**

Epson LX-400  
Epson LX-850  
Epson FX-1000  
Epson LQ-400  
Epson LQ-550  
Epson LQ-850 plus  
Epson LQ-1050 plus  
Epson LQ-1060 Color  
Epson SQ-850  
Epson SQ-2550 inkjet  
Epson SQ-2500 inkjet  
Epson TSQ-4800 inkjet  
Epson DLQ-2000  
Epson TLQ-4800  
Epson AP-800 Color  
Epson GQ-5000 Laser  
Epson GQ-3500 Laser

**PLOTTERS.DRV**

HP 7470A Plotter  
HP 7475A Plotter  
HP 7550A Plotter  
HP 7580A Plotter  
HP 7580B Plotter  
HP 7585A Plotter  
HP 7585B Plotter  
HP 7586B Plotter  
HP ColorPro - HP7440A  
HP DraftMaster I  
HP DraftMaster II  
HP DraftPro  
IBM 6180 Plotter  
IBM 6182 Plotter  
IBM 6184 Plotter  
IBM 6186-1 Plotter  
IBM 6186-2 Plotter  
IBM 7371 Plotter  
IBM 7372 Plotter  
IBM 7374 Plotter  
IBM 7375-1 Plotter  
IBM 7375-2 Plotter



---

## **B.2 WIN-OS/2 Printer Drivers**

### **PRINTER DRIVER DISKETTE #1**

#### **TTY.DRV**

Generic / Text Only

#### **OLIPRIN2.DRV**

Olivetti DM 250'

Olivetti DM 400

Olivetti PR 24

#### **QWIII.DRV**

IBM QuietWriter III

#### **TOSHIBA.DRV**

Toshiba P1351

Toshiba P351

### **PRINTER DRIVER DISKETTE #2**

#### **PROPRINT.DRV**

IBM Proprinter II

IBM Proprinter III

IBM Proprinter XL II

IBM Proprinter XL

IBM Proprinter

IBM Proprinter X24

IBM Proprinter X24e

IBM Proprinter XL24

IBM Proprinter XL24e

### **PRINTER DRIVER DISKETTE #3**

#### **HPPCL.DRV**

Agfa Compugraphic Genics

Apricot Laser

Epson EPL-6000

Epson GQ-3500

HP LaserJet 2000

HP LaserJet 500+

HP LaserJet IID

HP LaserJet IIP

HP LaserJet Plus

HP LaserJet Series II

HP LaserJet

Kyocera F-Series

NEC Silentwriter LC 860 Plus

NEC Silentwriter LC 860

Okidata LaserLine 6

Olivetti ETV 5000

Olivetti PG 108

Olivetti PG 208 M2

Olivetti PG 308 HS

QuadLaser I  
Tandy LP-1000  
Tegra Genesis  
Toshiba PageLaser12  
Wang LDP8

HPPCL5A.DRV  
HP LaserJet III

IBM238X.DRV  
IBM 238X

IBM239X.DRV  
IBM 2390/91

IBM4019.DRV  
IBM Laser Printer 4019  
IBM Laser Printer 4029

IBM4072.DRV  
IBM 4072

#### **PRINTER DRIVER DISKETTE #4**

CANONIII.DRV  
Canon LBP-8III/LBP-4

CITOH.DRV  
AT&T 470/475  
C-Itch 8510

DESKJET.DRV  
HP DeskJet Family

DM600.DRV  
Olivetti DM 600

EPSON24.DRV  
Epson L-750/1000  
Epson LQ-1500  
Epson LQ-2500/2550  
Epson LQ-500/510  
Epson LQ-800/1000  
Epson LQ-850/950/1050  
Epson SQ-2500  
Epson DFX-5000  
Epson EX-800/1000  
Epson FX-100  
Epson FX-100 +  
Epson FX-185/286  
Epson FX-80  
Epson FX-80 +  
Epson FX-85  
Epson FX-850/1050  
Epson FX-86e/286e

Epson JX-80  
Epson LX-80  
Epson LX-800/810  
Epson LX-86  
Epson MX-100  
Epson MX-80/80F/T  
Epson RX-100  
Epson RX-80/80F/T  
Epson T-1000  
Epson T-750

**FUJIMTRX.DRV**

Fujitsu DL 2400  
Fujitsu DL 2600  
Fujitsu DL 3300  
Fujitsu DL 3400  
Fujitsu DL 5600  
Fujitsu DX 2200  
Fujitsu DX 2300  
Fujitsu DX 2400  
Fujitsu DX 3100

**HPPLOT.DRV**

AT&T 435  
HP 7470A  
HP 7475A  
HP 7550A  
HP 7580A  
HP 7580B  
HP 7585A  
HP 7585B  
HP 7586B  
HP ColorPro  
HP ColorPro with GEC  
HP DraftMaster I  
HP DraftMaster II  
HP DraftPro DXL  
HP DraftPro EXL  
HP DraftPro

**IBMCOLOR.DRV**

IBM Color Printer

**IBMGRX.DRV**

AT&T 473/478  
IBM Graphics  
Okidata 92/93-IBM

**LBP8II.DRV**

Canon LBP-8II

**NEC24pin.DRV**

NEC PinWriter CP6  
NEC PinWriter CP7  
NEC PinWriter P2200

NEC PinWriter P5  
NEC PinWriter P5200  
NEC PinWriter P5300  
NEC PinWriter P5XL  
NEC PinWriter P6  
NEC PinWriter P7  
NEC PinWriter P9XL

**OKI24.DRV**

Okidata 390/391  
Okidata 393  
Okidata 393C

**OKI9.DRV**

Okidata ML 192  
Okidata ML 193  
Okidata ML 320  
Okidata ML 321

**OKI9IBM.DRV**

Okidata ML 192-IBM  
Okidata ML 193-IBM  
Okidata ML 320-IBM  
Okidata ML 321-IBM

**OLIPRINT.DRV**

Olivetti DM 100/1  
Olivetti DM 100/2  
Olivetti DM 100/4  
Olivetti DM 105  
Olivetti DM 280/282  
Olivetti DM 286/296  
Olivetti DM 290/292  
Olivetti DM 580  
Olivetti DM 590  
Olivetti PR 15B/17B  
Olivetti PR 19B

**PAINTJET.DRV**

HP PaintJet Series

**PSCRIPT.DRV**

AST TurboLaser/PS - R4081  
Agfa 9000 Series PS  
Agfa Compugraphic 400PS  
Apple LaserWriter II NT/NTX  
Apple LaserWriter Plus  
Apple LaserWriter  
Dataproducts LZR-2665  
Digital LN03R ScriptPrinter  
Digital LPS PrintServer 40  
IBM 4019 v52.1 (17 Fonts)  
IBM 4019 v52.1 (39 Fonts)  
IBM 4029 v52.3(17 Fonts,300 Dpi)  
IBM 4029 v52.3(17 Fonts,600 Dpi)

IBM 4029 v52.3(39 Fonts,300 Dpi)  
IBM 4029 v52.3(39 Fonts,600 Dpi)  
IBM Personal Page Printer II-030  
IBM Personal Page Printer II-031  
IBM Personal Pageprinter  
Linotronic 100/300/500  
NEC Colormate PS  
NEC Silentwriter LC 890  
NEC Silentwriter LC 890XL  
NEC Silentwriter2 290 v52.0  
NEC Silentwriter2 90 v52.2  
Oki OL840/PS v51.8  
Olivetti PG 303  
Olivetti PG 308 HS  
QMS ColorScript 100  
QMS-PS 2200 v51.0  
QMS-PS 800 Plus  
QMS-PS 800  
QMS-PS 810  
QMS-PS 820 v51.7  
TI OmniLaser 2108  
TI OmniLaser 2115  
TI microLaser PS17 v52.1  
TI microLaser PS35 v52.1  
Varityper VT-600  
Wang LCS15 FontPlus  
Wang LCS15

**TH760.DRV**

Hermes 820  
Olivetti TH 760

**THINKJET.DRV**

HP ThinkJet (2225 C-D)

**TI850.DRV**

TI 850/855

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## Glossary

**ANSI.** American National Standards Institute; U.S.-based organization which defines standards for computing devices, protocols, programming languages etc.

**API.** Application Programming Interface; term used to describe the set of functions by which an application may gain access to operating system services.

**BIOS.** Basic Input/Output System; code which controls the interface between a system and its attached devices, at the hardware level.

**bit.** A binary digit, which may be either zero or one. Bits are represented within a computing device by the presence or absence of an electrical or magnetic pulse at a particular point, indicating a one or a zero respectively.

**bitmap.** Method of displaying graphical data as a raster image. A bitmap is created by representing each point in a picture by one or more bits which indicate various properties (color, tone etc) of that point.

**Boot Manager.** Feature of OS/2 Version 2.0 which allows multiple partitions to exist on fixed disks in the same machine, with a separate operating system on each partition. At boot time, the user may select the desired operating system with which to start the machine.

**byte.** A logical data unit composed of eight binary digits (bits).

**CD-ROM.** Compact Disk Read-Only Memory; technology where data is stored on an optical disk for reading by a computer system equipped with an appropriate reading device. CD-ROM storage media may not be updated by the computer system, although certain implementations allow the media to be erased and re-written.

**DDE.** Dynamic Data Exchange; interprocess communication protocol used by applications to define dynamic links. Information updated in one application is automatically reflected in other applications linked to the first application via DDE.

**device driver.** Code which handles the translation of generic device commands into specific commands for the required physical device and vice versa, allowing operating system interaction with physical devices attached to the system.

**DLL.** Dynamic link library; application module containing routines and/or resources, which is dynamically linked with its parent application at load time or runtime rather than during the linkage editing

process. The use of DLLs enables decoupling of application routines and resources from the parent program, enhancing code independence, facilitating maintenance and reducing resident memory consumption.

**DMA.** Direct Memory Addressing; technique by which transfers to and from system memory are made by an independent control chip rather than by the system's main processor, thereby resulting in improved overall performance.

**DOS.** Disk operating system; generally used in reference to IBM PC DOS, the single-tasking 16-bit real-mode operating system designed for Intel 8086 processors, and developed by Microsoft Corporation as MS DOS in the early 1980s. IBM subsequently licensed MS DOS for use on IBM Personal Computer and Personal System/2 machines, and has since undertaken joint development of later versions of the operating system in conjunction with Microsoft.

**extended attributes.** Information which may be associated with a file under OS/2 Version 1.2 or above (including Version 2.0), to indicate various properties of that file. Extended attributes are available with both the FAT and HPFS file systems. An application may define extended attributes for files which it creates, and may update the extended attributes of files upon which it operates. A number of standard extended attributes are defined by the operating system for commonly-used information. Extended attributes and their uses are described in the *IBM OS/2 Version 2.0 Control Program Reference*.

**FAT.** File Allocation Table; term used to describe the file system implemented by DOS and OS/2. This file system uses a file allocation table to contain the physical sector addresses of all files on the disk. The FAT file system is supported by OS/2 Version 2.0, along with the newer HPFS and other installable file systems.

**file system.** Component of the OS/2 operating system which is responsible for handling file input/output operations. Used by the print subsystem for spooling purposes.

**FSD.** File System Driver; code within the operating system which supports the implementation of a particular file system such as FAT or HPFS.

**GB.** Gigabyte; 1024 Megabytes, or 1024 x 1024 x 1024 bytes.

**Graphics Device Interface.** Programming interface provided by WINOS2 to enable Windows applications to take advantage of graphical functions.

**HPFS.** High Performance File System; file system first implemented under OS/2 Version 1.2, offering enhanced performance over the original FAT file system implemented in DOS and prior versions of OS/2. HPFS is an optional installation item under OS/2 Version 2.0; the FAT system may also be used to retain compatibility with DOS.

**IDT.** See interrupt descriptor table.

**Interrupt.** An electrical signal generated by a device or adapter within the system, to inform the operating system that an event, such as the completion of an I/O operation, has occurred. The operating system then processes the interrupt by passing control to a particular piece of code which handles the appropriate action in response to the event indicated.

**Interrupt descriptor table.** Table in memory which contains the addresses of processing routines for all defined interrupt levels in the system. When a device signals an interrupt to the operating system, the interrupt contains a code which is used as an index into the interrupt descriptor table.

**I/O.** Input/Output; term used to collectively describe the techniques and devices through which a computer system interfaces with storage devices, external systems and the user.

**Job object.** Transient Workplace Shell object which is used to represent a print job, such as a file being printed, in a print queue. When the user opens a view of a printer object, each of the print jobs in the queue associated with that printer object is displayed as a job object.

**KB.** Kilobyte; 1024 bytes.

**kernel device driver.** Physical device driver which interfaces with the port to which a printer device is attached. The kernel device driver performs the actual transmission of data through the port.

**logical drive.** In the context of Boot Manager, a subdivision of a fixed disk partition, which is regarded by an operating system as a logical entity. Logical drives are typically accessed using logical drive letters (for example, "C"). Logical drives are used to store operating system code, programs and data files. A primary partition may only contain a single logical drive, while an extended partition may contain multiple logical drives.

**MB.** Megabyte; 1024 Kilobytes, or 1024 x 1024 bytes.

**metafile.** File format used by OS/2 Presentation Manager for storing, retrieving and manipulating graphical representations. Also used to describe a file format used by the WINOS2 Graphics Device Interface (GDI), which is similar, but not identical to the Presentation Manager format.

**Multiple Virtual DOS Machines.** Feature of OS/2 Version 2.0 which enables multiple DOS applications to execute concurrently in fullscreen or windowed mode under OS/2 Version 2.0, in conjunction with other 16-bit or 32-bit applications, with full pre-emptive multitasking and memory protection between tasks. See also virtual DOS machine.

**MVDM.** See Multiple Virtual DOS Machines.

**NULL.** A binary zero. In "C" programming terms, NULL is typically used to refer to a pointer which is set to the binary zero value.

**partition.** An area of a fixed disk. A partition is composed of one or more logical drives, and is used to store the operating system code, programs and data files. A partition may be a primary partition or an extended partition.

**PIC.** Programmable Interrupt Controller; component of the 80386 processor complex which handles interrupts generated by devices within the system.

**port driver.** Component of the print subsystem which enables the user to configure physical printer ports. Two port drivers are provided with OS/2 Version 2.0; SERIAL.PDR and PARALLEL.PDR. These drivers are accessed from within the Workplace Shell environment using port objects.

**port object.** Workplace Shell object which represents the port driver for a particular output port. Port objects have configurable settings which may be altered from within the *Settings* notebook for a printer object.

**POST.** Power-On Self-Test; code typically stored on ROM (although the IBM PS/2 Model 90 and 95 allow POST code to be stored on fixed disk) which is invoked when a machine is powered on, in order to test the hardware.

**primary partition.** In the context of Boot Manager, a fixed disk partition which contains a single logical drive, and on which an operating system may be installed. Only one primary partition may be active (visible) on a fixed disk at any one time; other primary partitions are hidden from the operating system. Operating systems such as DOS and OS/2 Version 1.x require a primary partition for their installation; OS/2 Version 2.0 may be installed on a primary partition or an extended partition.

**print subsystem.** Component of the OS/2 V2.0 operating system which is responsible for spooling and printing output.

**printer object.** A Workplace Shell object located on the desktop or in a folder, which represents a printer device. File objects which are dropped on a printer object's icon are automatically printed. Each printer object has an associated print queue and, depending

upon the output configuration selected, may represent several physical devices or ports.

**printer driver.** File or set of files which describe the characteristics of a particular printer type to the print subsystem, so that print jobs are converted to the correct data format prior to being passed to a printer.

**printer driver object.** Workplace Shell object which represents a printer driver in the *Output* page in the *Settings* notebook for a printer object.

**privilege level.** In the context of the Intel 80386 processor architecture, the level of authority at which a task executes. There are four available privilege levels; under OS/2 Version 2.0, Level 0 is used for operating system kernel code; Level 1 is not used; Level 2 is used for applications which directly address I/O devices (such as communications applications); Level 3 is used for general application code.

**protected mode.** Mode of operation for the Intel 80286 and 80386/80486 processors, whereby the address space is expanded to 16 MB (80286) or 4 GB (80386/80486), and memory references are translated via segment selector and offset, enabling full memory protection between processes executing in the system. With the 80386/80486, paging is available in protected mode.

**queue driver.** Component of the print subsystem which is called by the spooler to pass print jobs from the print queue to the printer driver. Two queue drivers, PMPRINT and PMPLOT, are provided with OS/2 Version 2.0.

**queue driver object.** Workplace Shell object which represents the queue driver in the *Settings* notebook for a printer object.

**RAM.** Random Access Memory; term used to describe memory which may be dynamically read and written by a processor or other device during system operations. RAM is typically used to store program instructions and data which not being operated upon by the processor at the current moment in time, but which are required for the logical unit of work currently being carried out.

**real mode.** Default mode of operation for the Intel 80286 and 80386 processors, and the only mode of operation for the 8086 processor. In real mode, the processor acts as a 16-bit device, its physical memory address space is limited to 1 MB, and memory references translate directly to physical addresses. With the 80386, paging is not supported in real mode.

**ROM.** Read-Only Memory; term used to describe memory which may be read, but not written to, during system operations. ROM is typically used to store basic hardware initialization instructions, BIOS or self-testing code, which is required to be available prior to accessing the disk subsystem.

**SCSI.** Small Computer Systems Interface; interface standard defined by ANSI SCSI Standard X3.131-1986, which defines a bus architecture and communication protocols for interaction of up to eight computing devices.

**service layer.** Executable code which performs the operating system function requested by an application using an API.

**spooler.** Component of the operating system which handles spooling of multiple print jobs. OS/2 Version 2.0 uses two spoolers; the OS/2 spooler is used by OS/2 and DOS applications, and the WINOS2 spooler is used by WINOS2 applications. These two spoolers work in cooperation with one another, and in conjunction with one or more print queues.

**spooler object.** Workplace Shell object which resides, by default, in the OS/2 *System* folder. This object represents the OS/2 system spooler. The WINOS2 spooler is represented by the WINOS2 Print Manager.

**spool file.** File which exists in a print queue and represents the data for a print job. A spool file is read from disk by the queue driver and passed to a printer driver associated with the print queue.

**trap 000D.** See general protection exception.

**trap 000E.** See page fault exception.

**task state segment.** Structure used to store the control information for a system task when a task switch occurs. When the task becomes active once again, registers and other control information are loaded from the TSS.

**virtual device driver.** Form of device driver used by DOS applications executing in a DOS virtual machine, in order to access devices which must be shared with other processes in the system, such as the screen or mouse. The virtual device driver maps DOS device commands to the normal (physical) device driver under OS/2 Version 2.0.

**virtual DOS machine.** A protected mode process under OS/2 Version 2.0 which emulates a DOS operating system environment, such that DOS applications executing within the virtual machine operate exactly as if they were running under DOS. DOS virtual machines support both text and graphics applications. Virtual DOS machines make use of the virtual 8086 mode of the 80386 and 80486 processors.

**virtual machine.** See virtual DOS machine.

**virtual 8086 mode.** Mode of operation of the Intel 80386 and 80486 processors, which allows the processor to execute multiple concurrent tasks with each regarding the processor as its own distinct 8086 processor. This mode of operation provides full pre-



emptive multitasking and full memory protection between the virtual 8086 tasks.

**WINOS2.** Component of the OS/2 Version 2.0 operating system which enables OS/2 to load and run Windows applications.

**WINOS2 spooler.** Spooler for Windows applications, which is represented by the WINOS2 Printer Manager. The spooler for OS/2 and DOS applications is represented by the Spooler object.

**16-bit.** Term used to describe an application which uses the 16:16 addressing scheme implemented under DOS and previous versions of OS/2. In fact, such applications use a 24-bit address since the segment

selector and offset are normally overlapped. Such applications typically use the 16-bit instruction set implemented under the Intel 80286 processor.

**32-bit.** Term used to describe an application which uses the 0:32 addressing scheme implemented under OS/2 Version 2.0. Such applications may make full use of the 80386 instruction set.

**80386.** Intel 80386 microprocessor; the 32-bit processor upon which the OS/2 Version 2.0 operating system is based.

**80486.** Intel 80486 microprocessor; a 32-bit processor which implements a superset of the 80386 processor instruction set.

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